

2006 ACCESSORIES & EQUIPMENT

Wipers/Washer Systems - Lucerne

SPECIFICATIONS

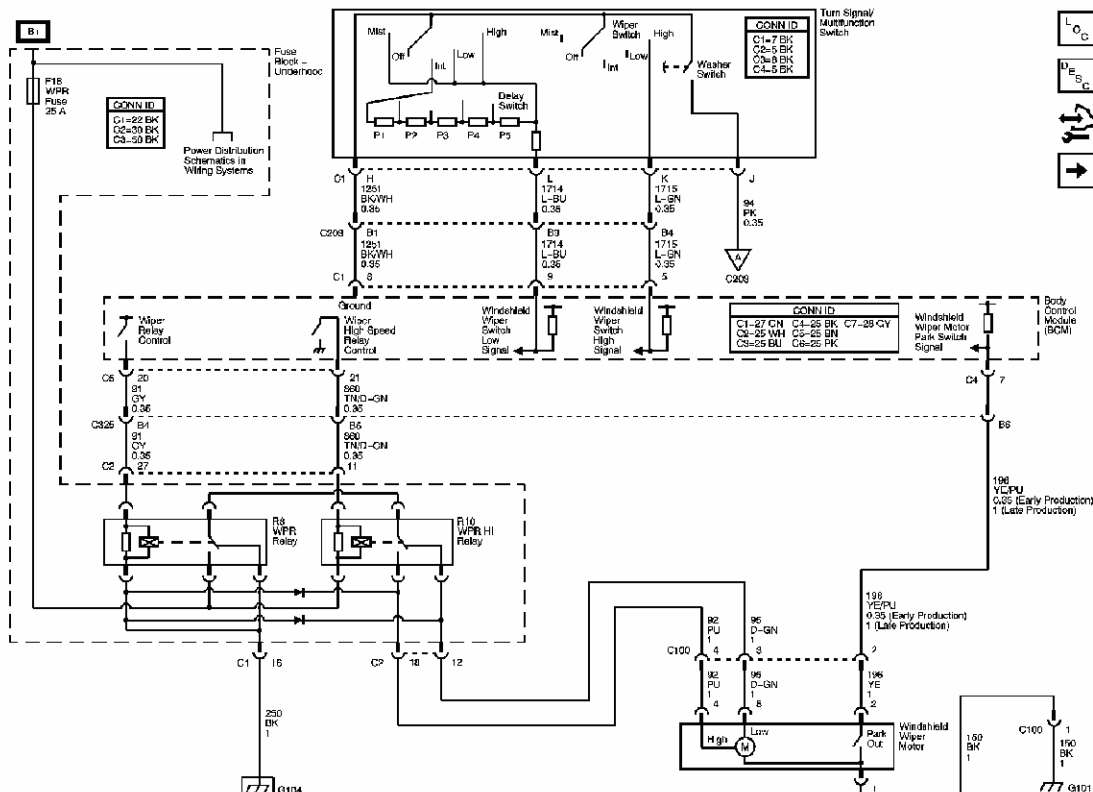
FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Windshield Washer Solvent Container Screws	6 N.m	53 lb in
Windshield Washer Solvent Heater Nuts	10 N.m	89 lb in
Wiper Arm Nut	32 N.m	24 lb ft
Wiper Drive System Module Screws	9 N.m	80 lb in
Wiper Motor Screws	10 N.m	89 lb in

SCHEMATIC AND ROUTING DIAGRAMS

WIPER/WASHER SCHEMATICS



Courtesy of GENERAL MOTORS CORP.

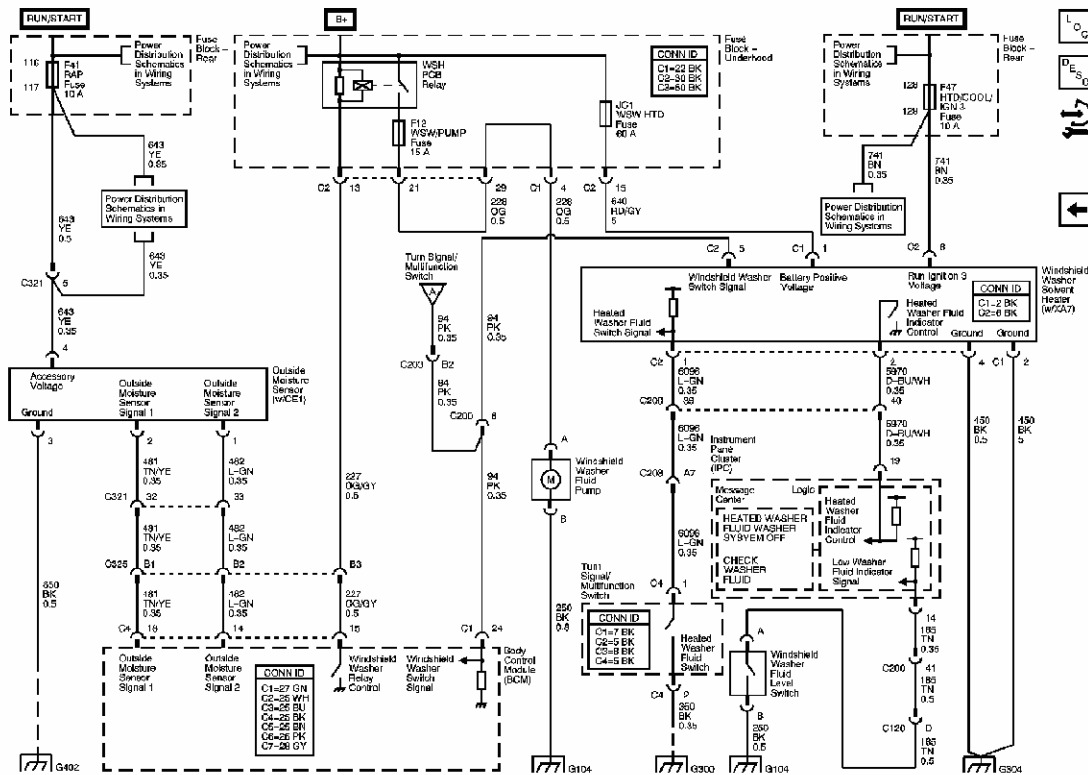


Fig. 2: Outside Moisture Sensor & Windshield Washer Solvent Heater Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

WIPER/WASHER COMPONENT VIEWS

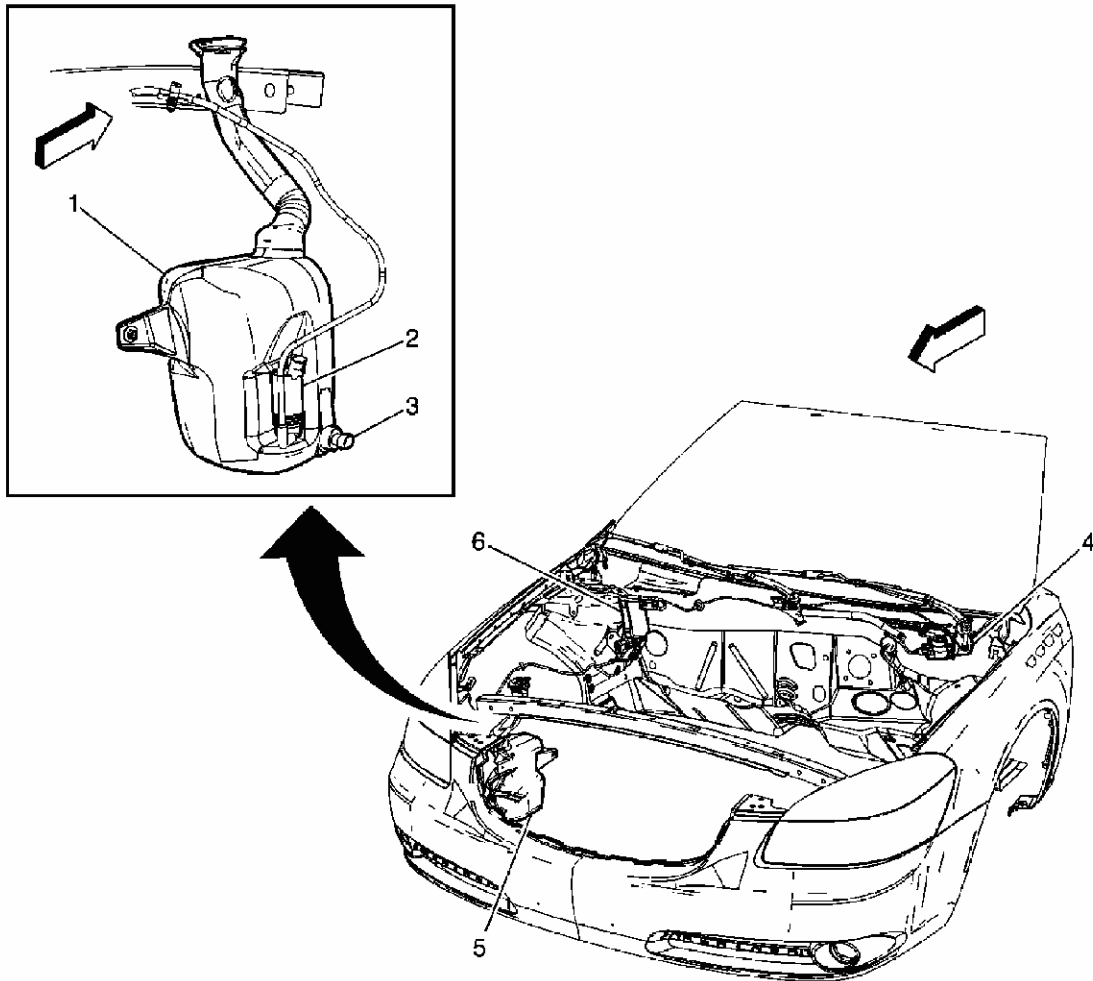


Fig. 3: Identifying Wiper/Washer Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Windshield Washer Fluid Container
2	Windshield Washer Fluid Pump
3	Windshield Washer Fluid Level Switch
4	Windshield Wiper Motor
5	Windshield Washer Fluid Container
6	Windshield Heated Washer Fluid Module (XA7)

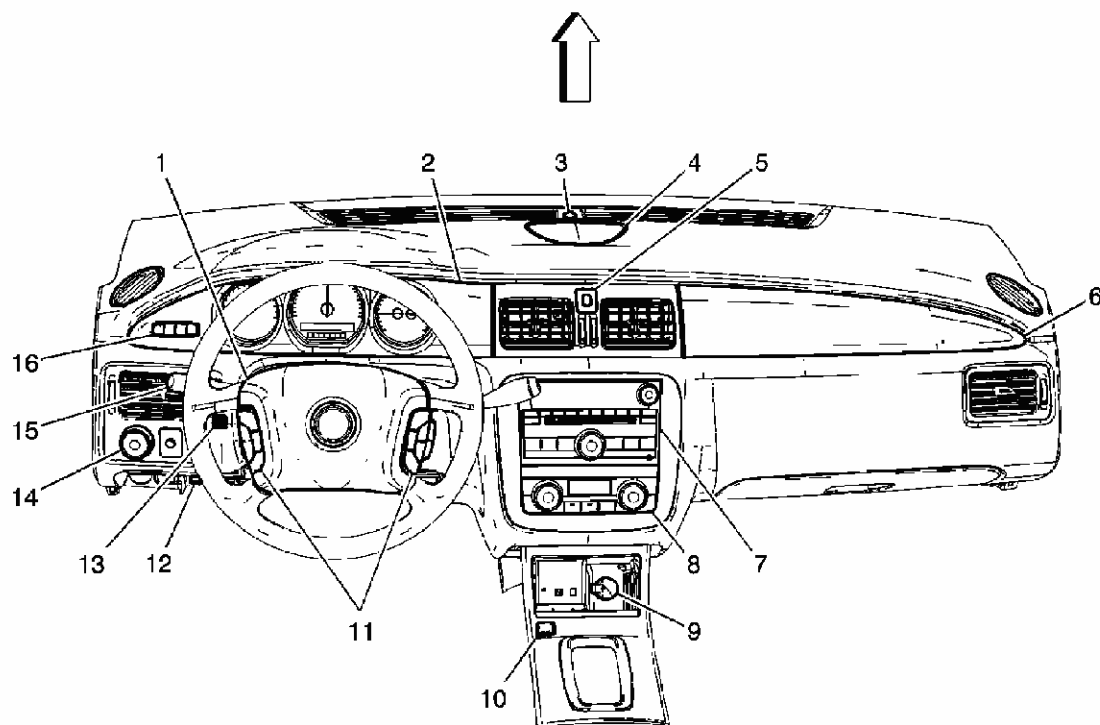


Fig. 4: Identifying Instrument Panel (I/P) Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	Inflatable Restraint Steering Wheel Module
2	Instrument Panel Cluster (IPC)
3	Sunload Twilight Sensor
4	Speaker - Front Center (UQA)
5	Hazard Switch
6	Inflatable Restraint I/P Module
7	Radio
8	HVAC Control Module
9	Auxiliary Power Outlet - Console (A51)/Cigar Lighter (DT4 w/A51)
10	Traction Control Switch
11	Steering Wheel Controls
12	Data Link Connector (DLC)
13	Air Temperature Sensor - Inside (CJ2)
14	Headlamp Switch
15	Turn Signal/Multifunction Switch
16	Driver Information Display Switch

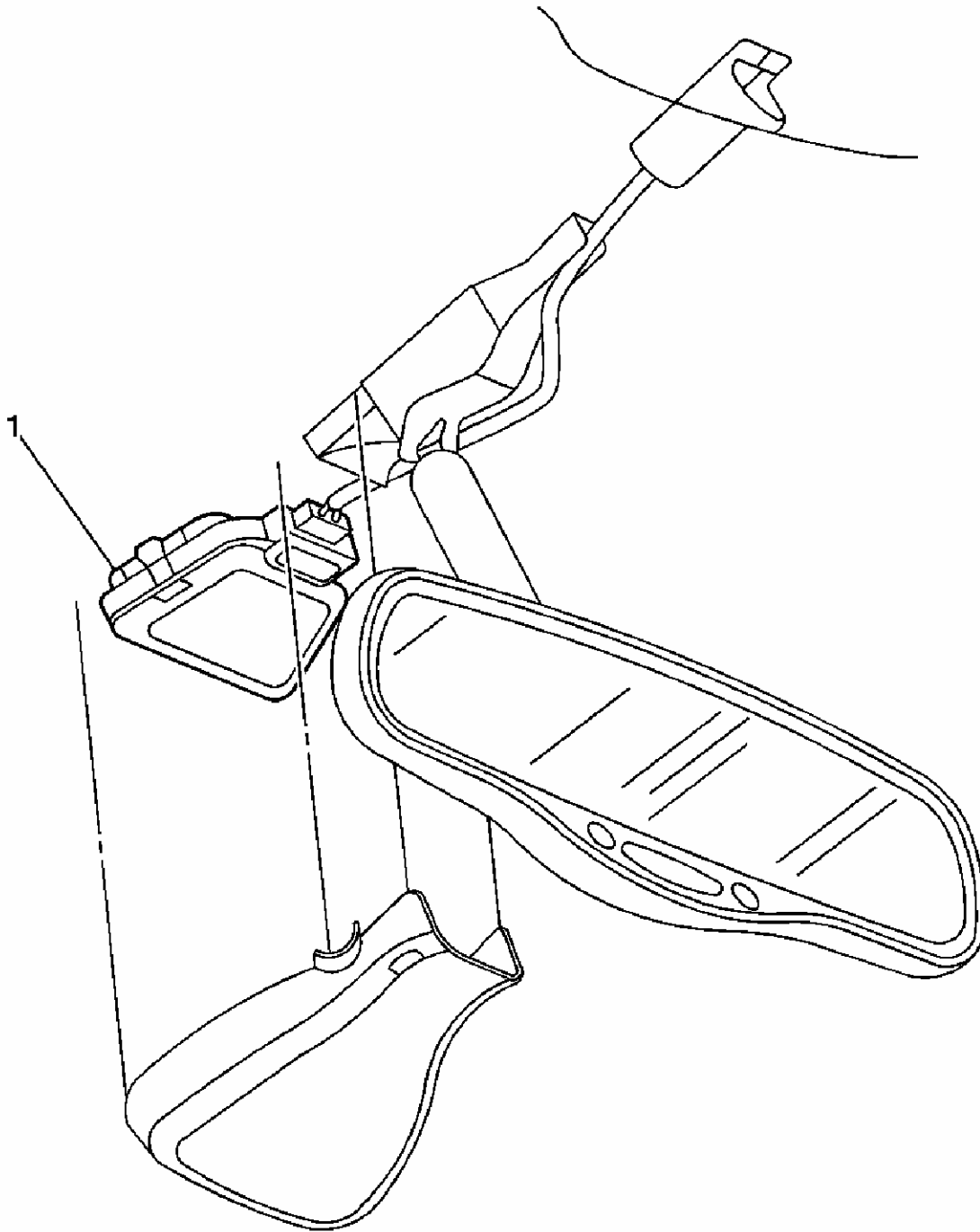


Fig. 5: Upper Center Of Windshield Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Outside Moisture Sensor (CE1)

Outside Moisture Sensor (CE1)

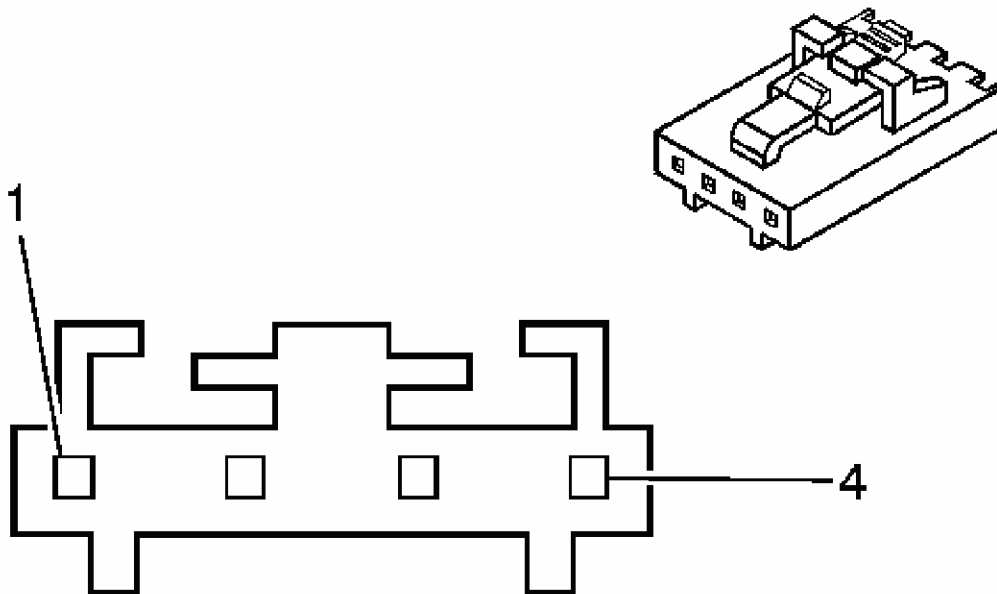


Fig. 6: Outside Moisture Sensor (CE1) Connector End View
 Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 43645-0400
- Service: 15306387
- Description: 4-Way F Micro Fit (BK)

Terminal Part Information

- Pins: 1, 2, 4, 3
- Terminal/Tray: 43030-0010/23
- Core/Insulation Crimp: Pins 1, 2, 4 - H/H
- Core/Insulation Crimp: Pins 3 - See Terminal Repair Kit
- Release Tool/Test Probe: J-38125-213/J-35616-64B (L-BU)

Outside Moisture Sensor (CE1)

Pin	Wire Color	Circuit No.	Function

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1	L-GN	482	Outside Moisture Sensor Signal 2
2	TN/YE	481	Outside Moisture Sensor Signal 1
3	BK	850	Ground
4	YE	643	Accessory Voltage

Windshield Washer Fluid Level Switch

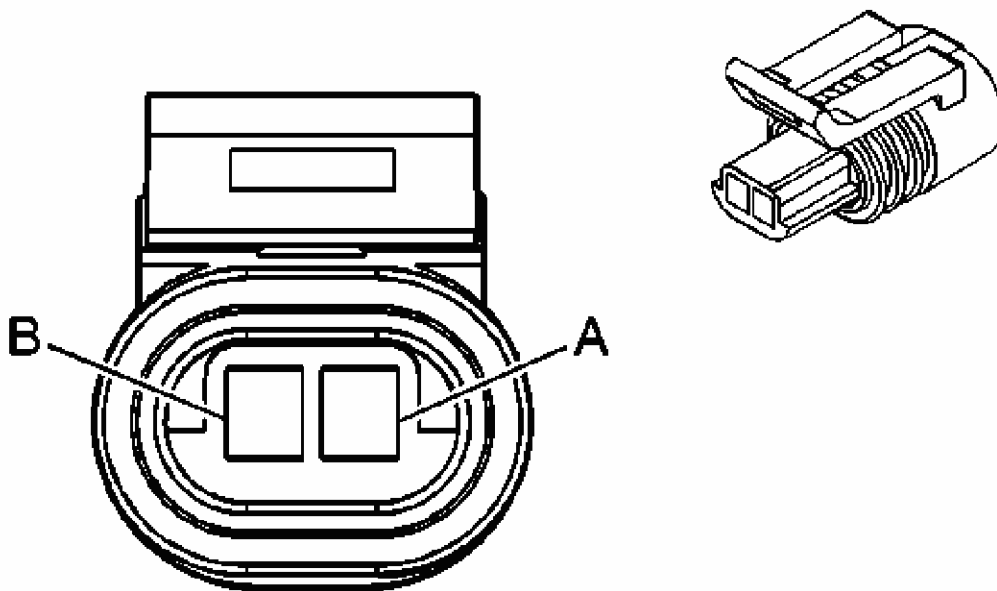


Fig. 7: Windshield Washer Fluid Level Switch Connector End View
Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 12162193
- Service: 88987993
- Description: 2-Way F Metri-Pack 150.2 Series, Pull To Seat (BK)

Terminal Part Information

- Terminal/Tray: 12124075/5
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12180559-1/J-35616-2A (GY)

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Windshield Washer Fluid Level Switch

Pin	Wire Color	Circuit No.	Function
A	TN	185	Low Washer Fluid Indicator Control
B	BK	250	Ground

Windshield Washer Fluid Pump

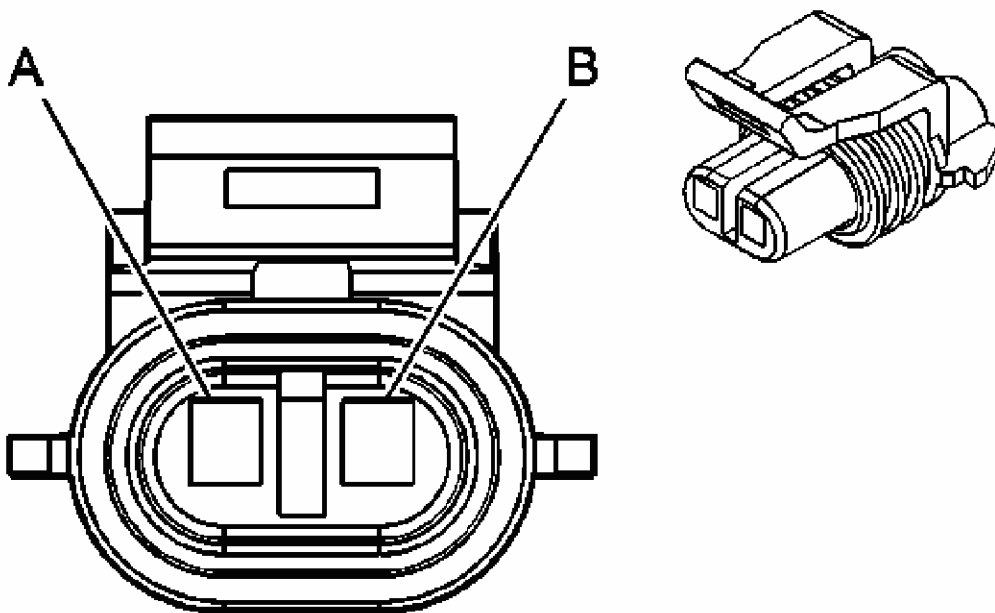


Fig. 8: Windshield Washer Fluid Pump Connector End View
Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 12052641
- Service: 12102747
- Description: 2-Way F Metri-Pack 150 Series (BK)

Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

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Windshield Washer Fluid Pump

Pin	Wire Color	Circuit No.	Function
A	OG	228	Windshield Washer Pump Control
B	BK	250	Ground

Windshield Washer Solvent Heater C1 (XA7)

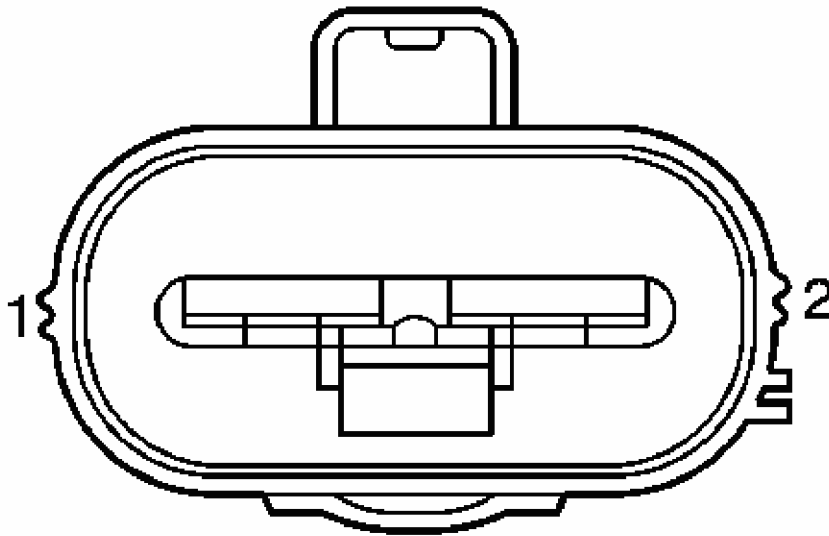


Fig. 9: Windshield Washer Solvent Heater C1 (XA7) Connector End View
Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 7282-3214-30
- Service: See Catalog
- Description: 2-Way M (BK)

Terminal Part Information

- Terminal/Tray: 7114-3250/14
- Core/Insulation Crimp: G/3
- Release Tool/Test Probe: 12094430/J-35616-21 (RD)

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Windshield Washer Solvent Heater C1 (XA7)

Pin	Wire Color	Circuit No.	Function
1	RD/GY	640	Battery Positive Voltage
2	BK	450	Ground

Windshield Washer Solvent Heater C2 (XA7)

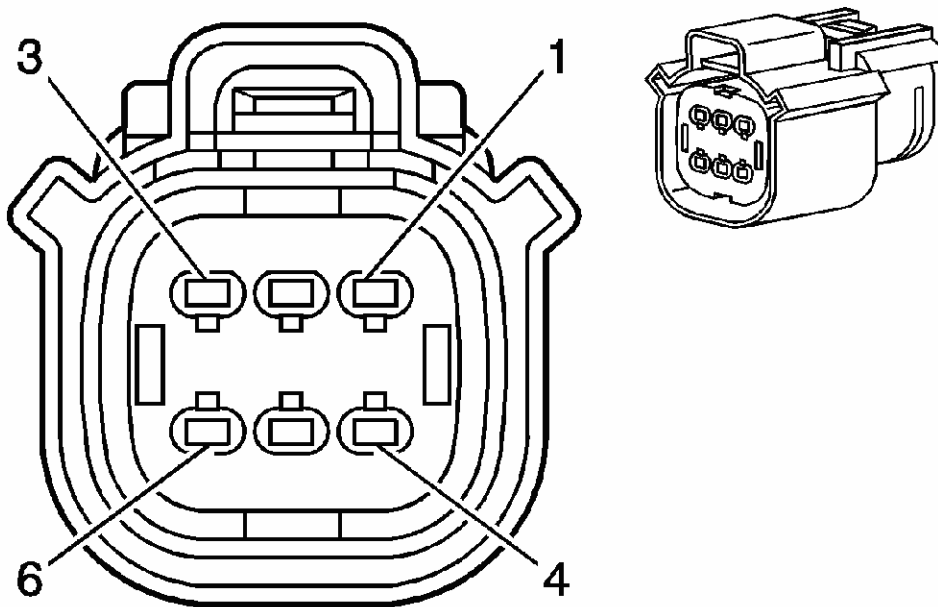


Fig. 10: Windshield Washer Solvent Heater C2 (XA7) Connector End View
Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 33472-0611
- Service: See Catalog
- Description: 6-Way F (BK)

Terminal Part Information

- Pins: 1, 2, 4, 5, 6
- Terminal/Tray: 33012-1003/23
- Core/Insulation Crimp: 2/E/2
- Release Tool/Test Probe: J-38125-217/J-35616-2A (GY)

Windshield Washer Solvent Heater C2 (XA7)

Pin	Wire Color	Circuit No.	Function

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1	L-GN	6096	Washer Fluid Heated Control Switch Signal
2	D-BU/WH	5970	Washer Fluid Heated Control Switch LED Supply Voltage
3	-	-	Not Used
4	BK	450	Ground
5	PK	94	Windshield Washer Switch Signal
6	BN	741	Ignition 3 Voltage

Windshield Wiper Motor

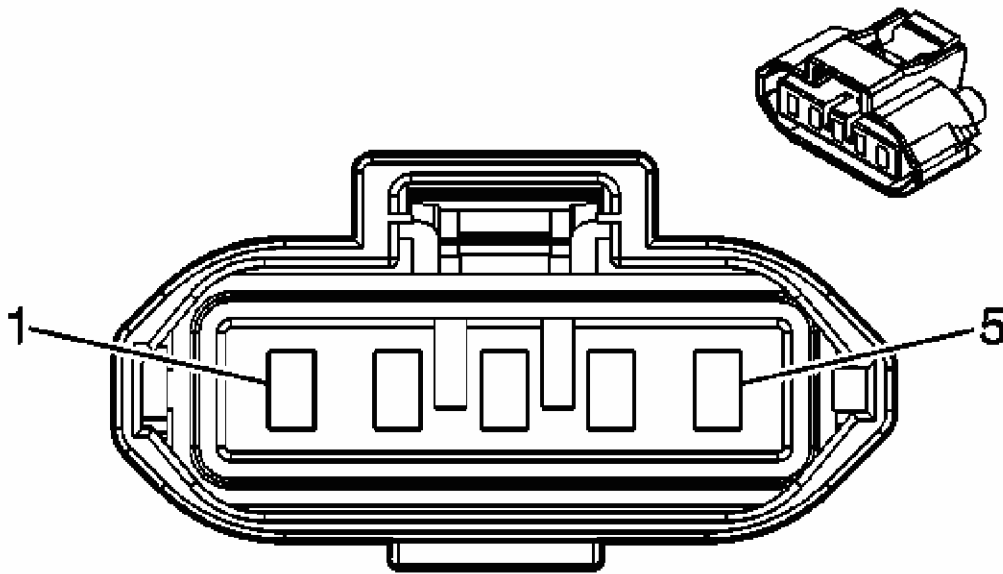


Fig. 11: Windshield Wiper Motor Connector End View
Courtesy of GENERAL MOTORS CORP.

Wiper/Washer Connector End Views

Connector Part Information

- OEM: 7283-7050-30
- Service: See Catalog
- Description: 5-Way F (BK)

Terminal Part Information

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- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Windshield Wiper Motor

Pin	Wire Color	Circuit No.	Function
1	BK	150	Ground
2	YE	196	Windshield Wiper Motor Park Switch Signal
3	-	-	Not Used
4	PU	92	Windshield Wiper Motor High Speed Control
5	D-GN	95	Windshield Washer Switch Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B3715</u>	** DESCRIPTION NOT COLLECTED **
<u>DTC B3873</u>	**DESCRIPTION NOT COLLECTED **
<u>DTC B3875</u>	**DESCRIPTION NOT COLLECTED **
<u>DTC B3922</u>	**DESCRIPTION NOT COLLECTED **

DIAGNOSTIC STARTING POINT - WIPER/WASHER SYSTEMS

Before you begin any diagnostic procedure, always review the system Description and Operation. Reviewing the Description and Operation will help you determine the correct diagnostic procedure when a malfunction exists. Reviewing the Description and Operation will also help you determine if the condition described by the customer is normal operation.

After reviewing the system description and operation, always begin the system diagnosis with the **Diagnostic System Check - Vehicle** . The Diagnostic System Check will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes and their status

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the

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system and where the procedure is located.

SCAN TOOL OUTPUT CONTROLS**Body Control Module (BCM)**

Scan Tool Output Control	Additional Menu Selection	Description
Wiper Relay	Vehicle Control Systems/Computer/Integrating Systems/Special Functions/Body Control Module/Miscellaneous Test	This output control commands the WPR PCB relay On and Off. The wiper motor will operate at Low speed when the wiper relay is On.
Wiper High Speed Relay	Vehicle Control Systems/Computer/Integrating Systems/Special Functions/Body Control Module/Miscellaneous Test	This output control commands the WPR Hi PCB relay On or Off. The wiper motor will operate at high speed when the wiper high relay is On.
Wiper Washer Motor	Vehicle Control Systems/Computer/Integrating Systems/Special Functions/Body Control Module/Miscellaneous Test	This output control commands the WSH PCB relay On or Off.

SCAN TOOL DATA LIST**Body Control Module (BCM)**

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition On/Engine Off			
Rain Sensor Signal	Wiper/Washer	Off/Low Speed/High Speed/Sensor Failed/Ckt. Fault Low/Ckt. Fault High/No Glass/No BCM Data	Off
Washer Relay Cmd.	Wiper/Washer	On/Off	Off
Windshield Washer Switch	Wiper/Washer	Active/Inactive	Inactive
Windshield Wiper Switch	Wiper/Washer	Off/Intermittent/Low/High/Switch Fault	Off
Wiper Delay Setting	Wiper/Washer	0,1,2,3,4,5	0
Wiper High Speed			

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Relay	Wiper/Washer	On/Off	Off
Wiper High Speed Switch	Wiper/Washer	Active/Inactive	Inactive
Wiper Park Switch	Wiper/Washer	Active/Inactive	Active
Wiper Relay Cmd.	Wiper/Washer	On/Off	Off

SCAN TOOL DATA DEFINITIONS

Rain Sensor Signal

The scan tool displays Off/Low Speed/Sensor Fault/Ckt Fault Low/Ckt. Fault High/No Glass/No BCM Data. When the wiper switch is in any one of the Delay settings the moisture sensor system will be active. Then when the sensor senses moisture on the glass, the scan tool will display Low Speed only while the wipers are On. If the BCM detects a system fault, the scan tool will display the fault as detected.

Washer Relay Cmd.

This output displays the operation mode of the washer pump.

Windshield Washer Switch

The BCM uses this input to determine if the wash switch is depressed. If it is depressed, the BCM commands the WPR PCB Relay ON and keeps it ON until 2 wipe cycles have completed after the switch has been released.

Windshield Wiper Switch

The scan tool displays Off/Intermittent/Low. When the wiper switch activated, the scan tool will display the selected intermittent or low switch input to the BCM.

Wiper Delay Setting

The scan tool displays 0,1,2,3,4,5. When the wiper switch is placed a Delay mode, the scan tool will display the delay mode number as selected.

Wiper High Speed Relay

The scan tool displays On/OFF. When the wiper switch is placed in the high speed position, the scan tool displays the BCM output command of the WPR Hi Relay.

Wiper High Speed Switch

The scan tool displays Inactive/Active. When the wiper switch is placed in the high speed

position, the scan tool displays the switch input to the BCM as Active.

Wiper Motor Park Switch

The body control module (BCM) uses this input to determine the position of the wipers. When the wipers are in the PARK or down position, the wiper motor park switch signal circuit of the BCM is pulled low and the scan tool will display Active.

Wiper Relay Cmd.

The scan tool displays On/Off. When the wipers are On, the scan tool displays the BCM output command of the WPR Relay as On.

DTC B3715

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B3715 00

Front Wiper Relay Drive Circuit

Diagnostic Fault Information

DTC B3715

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Washer Switch Signal	6 8	8	1	-
Windshield Wiper Motor Relay Coil Supply Voltage	B3715 00	2	6	-
Windshield Wiper Switch High Signal	6	4	1	-
Windshield Wiper Switch Low Signal	B3922 00	3	1	-
Windshield Wiper Motor Park Switch Signal	5	5	-	-
Windshield Wiper Motor				

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High Speed Control	2	4	-	-
Windshield Wiper Motor Low Speed Control	2	3	-	-
Windshield Wiper Motor Ground	-	2	-	-
Windshield Wiper Switch Ground	-	1	-	-
Wiper High Speed Relay Control	7	4	B3875 00	-
Wiper Relay Ground	-	2	-	-
1. Wipers and washers inoperative all modes 2. Wipers inoperative all modes and washers work 3. Delay or low speed wipers inoperative 4. High speed wipers inoperative 5. Wipers do not park 6. Wipers always ON 7. Wipers operate at high speed in the low speed mode 8. Washer malfunction				

Circuit/System Description

The body control module (BCM) monitors the control circuit of the wiper relay. The voltage level should be low while the wiper relay is de-energized and near system voltage when the relay is energized. After the BCM receives a low, intermittent or mist signal from the wiper/washer switch, it responds by applying battery voltage through the wiper relay control circuit to the coil side of the relay, energizing the WIPER Relay. Ground is supplied at all times to the coil side of the WPR Relay from G104.

Conditions for Running the DTC

This DTC can set only when the output is actively being requested by the BCM.

Conditions for Setting the DTC

If the BCM detects a short to ground in the wiper relay control circuit.

Action Taken When the DTC Sets

The BCM will not activate the output.

Conditions for Clearing the DTC

- The current DTC will become history when the request for the output is removed or when the condition for setting the fault is corrected.

- The history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information**Schematic Reference****Wiper/Washer Schematics****Connector End View Reference****Wiper/Washer Connector End Views****Electrical Information Reference**

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Testing

1. Ignition OFF, remove the WPR Relay from the underhood fuse block.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 86 and ground.
 - If greater than 5 ohms, test the ground circuit for an open/high resistance.
3. Connect a test lamp between the wiper relay control circuit terminal 85 and ground.
4. Ignition ON, command the Wiper Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, test or replace the BCM.
 - If the test lamp is always OFF, test the control circuit for a short to ground. If the circuit tests normal, test or replace the BCM.
5. If all circuits test normal, test or replace the WPR relay.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for BCM replacement, programming and setup**DTC B3873****Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor**DTC B3873 00**

Front Washer Relay Circuit

Diagnostic Fault Information**DTC B3873**

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Washer Switch Signal	2	1	3	-
Windshield Washer Pump Control	1	1	2	-
Windshield Washer Relay Control	2	1	B3873 00	-
Windshield Washer Pump Ground	-	1	-	-
Windshield Wiper Switch Ground	-	3	-	-
1. Washer Inoperative 2. Washers Always ON 3. Windshield Wiper System Malfunction				

Circuit/System Description

The windshield washer function is controlled by the body control module (BCM). When the washer switch is pressed, ground is applied through the switch contacts and the signal circuit to the BCM indicating the wash request. The BCM then applies ground through the control circuit to the coil side of the WSH Relay energizing the relay. With the relay energized, battery voltage from the WPR fuse is applied through the switch contacts of the relay, the WSW/PUMP Fuse and the control circuit to the windshield washer fluid pump.

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Conditions for Running the DTC

This DTC can set only when the output is actively being requested by the BCM.

Conditions for Setting the DTC

This DTC sets if the BCM detects a short to battery voltage in the windshield washer pump relay control circuit.

Action Taken When the DTC Sets

The BCM will not activate the output.

Conditions for Clearing the DTC

- The current DTC will become history when the request for the output is removed or when the condition for setting the fault is corrected.
- The history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- Scan Tool Output Controls
- Scan Tool Data List
- Scan Tool Data Definitions

Circuit/System Testing

1. Ignition OFF, disconnect the C2 harness connector at the underhood fuse block.
2. Connect a test lamp between the control circuit terminal 13 and battery voltage.

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3. Command the Wiper Washer Motor ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to ground. If the circuit tests normal, test or replace the BCM.
 - If the test lamp is always OFF, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
4. If all circuits test normal, test or replace the underhood fuse block.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for BCM replacement, setup and programming

DTC B3875

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B3875 00

Wiper High Speed Relay Circuit

Diagnostic Fault Information

DTC B3875

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Washer Switch Signal	6 8	8	1	-
Windshield Wiper Motor Relay Coil Supply Voltage	B3715 00	2	6	-
Windshield Wiper Switch High Signal	6	4	1	-
Windshield Wiper Switch Low Signal	B3922 00	3	1	-
Windshield Wiper Motor Park				

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Switch Signal	5	5	-	-
Windshield Wiper Motor High Speed Control	2	4	-	-
Windshield Wiper Motor Low Speed Control	2	3	-	-
Windshield Wiper Motor Ground	-	2	-	-
Windshield Wiper Switch Ground	-	1	-	-
Wiper High Speed Relay Control	7	4	B3875 00	-
Wiper Relay Ground	-	2	-	-
<ol style="list-style-type: none">1. Wipers and washers inoperative all modes2. Wipers inoperative all modes and washers work3. Delay or low speed wipers inoperative4. High speed wipers inoperative5. Wipers do not park6. Wipers always ON7. Wipers operate at high speed in the low speed mode8. Washer malfunction				

Circuit/System Description

The body control module (BCM) monitors the wiper high speed relay control circuit only when wiper high speed mode is active. When the wiper high speed mode is requested, the BCM responds by applying a ground through the wiper high speed relay control circuit to the coil side of the relay, energizing the WPR HI Relay.

Conditions for Running the DTC

This DTC can set only when the output is actively being requested by the BCM.

Conditions for Setting the DTC

This DTC sets if the BCM detects a short to battery voltage in the wiper high speed relay control circuit.

Action Taken When the DTC Sets

The BCM will not activate the output.

Conditions for Clearing the DTC

- The current DTC will become history when the request for the output is removed or

when the condition for setting the fault is corrected.

- The history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- Scan Tool Output Controls
- Scan Tool Data List
- Scan Tool Data Definitions

Circuit/System Testing

1. Ignition OFF, remove the WPR HI Relay from the underhood fuse block.
2. Connect a test lamp between the wiper high speed relay control circuit terminal 86 and battery voltage.
3. Ignition ON, command the Wiper High Speed Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to ground. If the circuit tests normal, test or replace the BCM.
 - If the test lamp is always OFF, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
4. If all circuits test normal, test or replace the WPR HI relay.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for BCM replacement, setup and programming

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DTC B3922**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor**DTC B3922 00**

Front Wiper Function Select Circuit

Diagnostic Fault Information**DTC B3922**

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Washer Switch Signal	6 8	8	1	-
Windshield Wiper Switch High Signal	6	4	1	-
Windshield Wiper Switch Low Signal	B3922 00	3	1	-
Windshield Wiper Motor Park Switch Signal	5	5	-	-
Windshield Wiper Motor High Speed Control	2	4	-	-
Windshield Wiper Motor Low Speed Control	2	3	-	-
Wiper Relay Control	B3715 00	2	6	-
Windshield Wiper Motor Ground	-	2	-	-
Windshield Wiper Switch Ground	-	1	-	-
Wiper High Speed Relay Control	7	4	B3875 00	-
Wiper Relay Ground	-	2	-	-

1. Wipers and washers inoperative all modes
2. Wipers inoperative all modes and washers work

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3. Delay or low speed wipers inoperative
4. High speed wipers inoperative
5. Wipers do not park
6. Wipers always ON
7. Wipers operate at high speed in the low speed mode
8. Washer malfunction

Circuit/System Description

The body control module (BCM) monitors the windshield wiper switch low signal circuit. When the wiper switch is placed in the low position, battery voltage is applied through the switch contacts, a series of resistors and the wiper switch low signal circuit to the BCM. The BCM then applies battery voltage through the wiper relay control circuit to energize the WPR relay. When energized, battery voltage from the WPR fuse is applied through the switch side of the WPR relay then through the switch side of the WPR HI relay to the windshield wiper motor.

Conditions for Running the DTC

The ignition switch is in the ON position.

Conditions for Setting the DTC

The BCM detects a short to ground on the windshield wiper switch low signal circuit.

Action Taken When the DTC Sets

- The BCM will not activate the low speed output.
- The windshield wipers will only operate in the high speed mode.

Conditions for Clearing the DTC

- The DTC will clear the current status when the condition for setting the fault is corrected.
- A history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Verification

Ignition ON, observe the scan tool Windshield Wiper Switch parameter while rotating the wiper switch. The reading should change between Off, Intermittent and Low.

Circuit/System Testing

1. Ignition OFF, disconnect the C1 harness connector at the turn signal/multifunction switch.
2. Ignition ON, verify the scan tool Windshield Wiper Switch parameter is not Switch Fault.
 - If Switch Fault, test the windshield wiper switch low signal circuit terminal L for a short to ground. If the circuit tests normal, replace the BCM.
3. If all circuits test normal, test or replace the turn signal/multifunction switch.

Component Testing**Multifunction Switch**

1. With the ignition OFF, disconnect the C1 harness connector at the turn signal/multifunction switch.
2. Test the resistance between terminals H and L. Rotate the wiper switch and compare the resistance readings to the values in the Windshield Wiper Switch Values table below for MIST, each DELAY and LOW speed.
 - If the resistance is not within the specified range, replace the turn signal/multifunction switch.
3. Test for infinite resistance between terminals H and K while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If the less than infinite, replace the turn signal/multifunction switch.
4. Test for less than 5 ohms of resistance with the wiper switch in the High speed position.
 - If greater than 5 ohm, replace the turn signal/multifunction switch.

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5. Test for infinite resistance between terminals H and J while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If less than infinite, replace the turn signal/multifunction switch.
6. Test for less than 5 ohm of resistance while pressing the WASHER switch.
 - If greater than 5 ohm, replace the turn signal/multifunction switch.

IMPORTANT: If the switch tests open in any switch position other than Off, test the wiper/washer switch signal circuits for a short to voltage before replacing the switch.

Wiper Switch Values

Switch Position	Resistance
Off	Infinite
Mist	300-364 ohms
Delay 1	3.48K-4.25K ohms
Delay 2	2.52K-3.08K ohms
Delay 3	1.78K-2.18K ohms
Delay 4	1.17K-1.44K ohms
Delay 5	697-851 ohms
Low	300-364 ohms

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Turn Signal Multifunction Switch Replacement**
- **Control Module References** for BCM replacement, setup and programming

SYMPTOMS - WIPER/WASHER SYSTEMS

IMPORTANT: The following steps must be completed before using the symptom tables:

1. Perform the **Diagnostic System Check - Vehicle** , in order to verify that all of the following conditions are true.
 - No DTCs are set.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Wiper/Washer**

**System Description and Operation (Wipers and Washers)
or Wiper/Washer System Description and Operation
(Heated Washer System).**

Visual/Physical Inspection

- Inspect the washer fluid reservoir for the proper fluid level and condition.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for aftermarket devices which could affect the operation of the Windshield Wiper/Washer System.

Intermittent

- If the wipers operate at low speed for approximately 3 seconds and then stop, the wiper motor park switch or its signal circuit, may be malfunctioning.
- Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Windshield Wiper System Malfunction**
- **Low Washer Fluid Indicator Malfunction**
- **Washer Malfunction**
- **Windshield Washer Solvent Heater Malfunction**
- **Moisture Sensing Feature Inoperative**
- **Wiper Blade Element Check**

WINDSHIELD WIPER SYSTEM MALFUNCTION**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information**Windshield Wiper System Malfunction**

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Washer Switch Signal	6 8	8	1	-
Windshield Wiper Motor Relay Coil Supply Voltage	B3715 00	2	6	-
Windshield Wiper Switch High Signal	6	4	1	-
Windshield Wiper Switch Low Signal	B3922 00	3	1	-
Windshield Wiper Motor Park Switch Signal	5	5	-	-
Windshield Wiper Motor High Speed Control	2	4	-	-
Windshield Wiper Motor Low Speed Control	2	3	-	-
Windshield Wiper Motor Ground	-	2	-	-
Windshield Wiper Switch Ground	-	1	-	-
Wiper High Speed Relay Control	7	4	B3875 00	-
Wiper Relay Ground	-	2	-	-
1. Wipers and washers inoperative all modes 2. Wipers inoperative all modes and washers work 3. Delay or low speed wipers inoperative 4. High speed wipers inoperative 5. Wipers do not park 6. Wipers always ON 7. Wipers operate at high speed in the low speed mode 8. Washer malfunction				

Circuit/System Description

Wiper Mist, Delay 1-5 and Low are all low speed wiper motor functions that are controlled by the body control module (BCM). When the wiper switch is placed in one of the LOW speed wiper modes, ground is applied through the switch contacts a series of internal resistors and the wiper switch low signal circuit to the BCM. In response to this signal, the BCM energizes the WPR Relay by applying battery voltage through the wiper relay control circuit to the coil side of the relay. This allows battery positive voltage from the WPR fuse to flow through the switch input side of the WPR Relay and out to the switch input side of the WIPER HI Relay. Since the wiper high relay is de-energized and its switch contacts are normally closed to the

low speed control circuit of the windshield wiper motor, the motor will operate at low speed.

When the wiper switch is placed in the HIGH speed position, ground is applied through the switch contacts and the wiper switch high signal circuit to the BCM indicating the wiper high speed request. The BCM then energizes WPR Relay as stated above and the WIPER HI Relay by applying ground through the control circuit to the coil side of the relay. With the wiper high relay energized and its switch contacts closed to the high speed control circuit of the wiper motor, the motor will operate at high speed.

Diagnostic Aids

- A short to ground in the following circuits will open the WPR fuse:
 - Ignition 1 voltage
 - Windshield wiper motor relay coil supply voltage
 - Windshield wiper switch high signal
 - Windshield wiper motor low speed control
 - Windshield wiper motor high speed control
- A short to B+ on any of the wiper/washer switch signal circuits will open the ground trace in the wiper switch.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Verification

BCM and Wiper Switch Verification

1. Ignition ON, observe the scan tool Windshield Wiper Switch and the Wiper Delay Setting parameters. The Windshield Wiper Switch reading should display Off, Intermittent and Low and the Wiper Delay Setting should display 0-5 while rotating the wiper switch through each delay setting to the low position.
 - If one or more of the Wiper Delay Setting parameters are inoperative and the Windshield Wiper Switch low speed parameter functions, replace the turn signal/multifunction switch.
 - If the low speed parameter is inoperative, perform the Multifunction Switch Circuit/System Testing and/or the Multifunction Switch Component Test.
2. With the wiper switch in the HIGH speed mode, observe the scan tool Wiper High Speed Switch parameter. The Wiper High Speed Switch reading should be Active.
 - If not Active, perform the Multifunction Switch Circuit/System Testing and/or the Multifunction Switch Component Test.
3. Observe the scan tool BCM Wiper Park Switch parameter. The reading should display Active when the wipers are parked and Inactive with the wipers ON or out of the park position.
 - If the Wiper Park Switch parameter is always Active or Inactive, perform the Wipers do not Park Circuit/System Testing.
4. If all wiper position parameters displayed correctly on the scan tool, perform the Wiper Motor Circuit/System Testing and/or the Wiper Motor Component Test.

BCM and Wiper Motor Verification

1. Command the windshield wiper motor to the off, low speed and high speed modes with a scan tool. Before commanding the wiper high speed mode, place the wiper switch in the low speed position. The wipers should perform the commanded state.
 - If one or more of the commanded states do not work, perform the Wiper Motor tests in Circuit/System Testing and/or Component test.
2. If all the wiper motor speeds function, perform the Multifunction Switch Circuit/System Testing and/or the Multifunction Switch Component Test.

Circuit/System Testing**Multifunction Switch Circuit/System Testing**

1. Ignition OFF, disconnect the C1 harness connector at the turn signal/multifunction switch.
2. Ignition OFF, test for less than 10 ohms of resistance between the ground circuit terminal H and ground.
 - If greater than 10 ohms, test the ground circuit for an open/high resistance. If the

circuit tests normal, test or replace the BCM.

3. Verify the scan tool Windshield Wiper Switch parameter is Off.
 - If not Off, test the signal circuit terminal L for a short to ground. If the circuit tests normal, test or replace the BCM.
4. Verify the scan tool Wiper High Speed Switch parameter is Inactive.
 - If not Inactive, test the signal circuit terminal K for a short to ground. If the circuit tests normal, test or replace the BCM.
5. Install a 3A fused jumper wire between the signal circuit terminal L and ground. Verify the scan tool Windshield Wiper Switch parameter is Switch Fault.
 - If not Switch Fault, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
6. Install a 3A fused jumper wire between the signal circuit terminal K and ground. Verify the scan tool Wiper High Speed Switch parameter is Active.
 - If not Active, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
7. If all circuits test normal, test or replace the turn signal/multifunction switch.

Wipers Do Not Park Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the windshield wiper motor.
2. Ignition ON, verify the scan tool BCM Wiper Park Switch parameter is Inactive.
 - If not Inactive, test the signal circuit terminal 2 for a short to ground. If the circuit tests normal, test or replace the BCM.
3. Install a 3A fused jumper wire between the wiper motor park switch signal circuit terminal 2 and ground. Verify the scan tool Wiper Park Switch parameter is Active.
 - If not Active, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the BCM.
4. If all circuits test normal, test or replace the windshield wiper motor.

Wiper Motor Circuit/System Testing

1. Ignition OFF, remove the WPR Relay from the underhood fuse block.
2. Test for less than 5 ohms of resistance between the wiper relay ground circuit terminal 86 and ground.
 - If greater than 5 ohms, test the ground circuit for an open/high resistance.
3. Connect a test lamp between the control circuit terminal 85 and ground.
4. Ignition ON, command the Wiper Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, test or replace the BCM.

- If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, test or replace the BCM.
- 5. Ignition OFF, install the WPR Relay.
- 6. Remove the WPR HI Relay from the underhood fuse block.
- 7. Connect a test lamp between the supply voltage circuit terminal 30 and ground.
- 8. Ignition ON, command the Wiper Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the supply voltage circuit for a short to voltage. If the circuit tests normal, replace the WPR Relay.
 - If the test lamp is always OFF, test the supply voltage circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the WPR Relay.
- 9. Connect a test lamp between the control circuit terminal 86 and battery voltage.
- 10. Ignition ON, command the Wiper High Speed Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to ground. If the circuit tests normal, test or replace the BCM.
 - If the test lamp is always OFF, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
- 11. Ignition OFF, replace the WPR HI Relay.
- 12. Disconnect the harness connector at the wiper motor.
- 13. Test for less than 1 ohm of resistance between the wiper motor ground circuit terminal 1 and ground.
 - If greater than 1 ohm, test the ground circuit for an open/high resistance.
- 14. Connect a test lamp between the control circuit terminal 5 and ground.
- 15. Ignition ON, command the Wiper Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the WPR HI Relay.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the WPR HI Relay.
- 16. Connect a test lamp between the control circuit terminal 4 and ground.
- 17. Place the wiper switch in the LOW speed position. Command the Wiper High Speed Relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the WPR HI Relay.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the WPR HI Relay.

18. If all circuits test normal, test or replace the Windshield Wiper Motor.

Component Testing

Multifunction Switch

1. With the ignition OFF, disconnect the C1 harness connector at the turn signal/multifunction switch.
2. Test the resistance between terminals H and L. Rotate the wiper switch and compare the resistance readings to the values in the Windshield Wiper Switch Values table below for MIST, each DELAY and LOW speed.
 - If the resistance is not within the specified range, replace the turn signal/multifunction switch.
3. Test for infinite resistance between terminals H and K while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If the less than infinite, replace the turn signal/multifunction switch.
4. Test for less than 5 ohms of resistance with the wiper switch in the High speed position.
 - If greater than 5 ohms, replace the turn signal/multifunction switch.
5. Test for infinite resistance between terminals H and J while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If less than infinite, replace the turn signal/multifunction switch.
6. Test for less than 5 ohms of resistance while pressing the WASHER switch.
 - If greater than 5 ohms, replace the turn signal/multifunction switch.

IMPORTANT: If the switch tests open in any switch position other than Off, test the wiper/washer switch signal circuits for a short to voltage before replacing the switch.

Wiper Switch Values

Switch Position	Resistance
Off	Infinite
Mist	300-364 ohms
Delay 1	3.48K-4.25K ohms
Delay 2	2.52K-3.08K ohms
Delay 3	1.78K-2.18K ohms
Delay 4	1.17K-1.44K ohms
Delay 5	697-851 ohms
Low	300-364 ohms

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1. Ignition OFF, disconnect the harness connector at the windshield wiper motor.
2. Install a 25A fused jumper wire between the control terminal 5 and 12 volts. Install a jumper wire between the ground terminal 1 and ground.
3. The wiper motor should be in low speed mode.
 - o If the wiper motor is not in the low speed mode replace the motor.
4. Install a 25A fused jumper wire between the control terminal 4 and 12 volts. Install a jumper wire between the ground terminal 1 and ground.
5. The wiper motor should be in the high speed mode.
 - o If the wiper motor is not in the high speed mode replace the motor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Turn Signal Multifunction Switch Replacement**
- **Windshield Wiper Motor Replacement**
- **Control Module References** for BCM replacement, programming and setup

LOW WASHER FLUID INDICATOR MALFUNCTION

Low Washer Fluid Indicator Malfunction

Step	Action	Yes	No
Schematic Reference: <u>Wiper/Washer Schematics</u> Connector End View Reference: <u>Wiper/Washer Connector End Views</u> DEFINITION: The check washer fluid message is always displayed or does not display with low washer fluid.			
1	Did you review the Wiper/Washer System Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Symptoms - Wiper/Washer Systems</u>
2	Verify that the low washer fluid indicator malfunction fault is present. Does the system operate as described in the system description and operation?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u>	Go to Step 3
3	Is the check washer fluid message always On?	Go to Step 4	Go to Step 5
	<ol style="list-style-type: none">1. Turn the ignition OFF.2. Disconnect the windshield washer fluid level switch connector.		

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4	<p>3. Turn the ignition ON.</p> <p>Is the check washer fluid message displayed on the driver information center (DIC)?</p>	Go to Step 7	Go to Step 9
5	<p>1. Turn the ignition OFF.</p> <p>2. Disconnect the windshield washer fluid level switch connector.</p> <p>3. Connect a 3-amp fused jumper wire from the washer fluid level switch signal circuit terminal in the washer fluid level switch connector to a good ground.</p> <p>4. Turn the ignition ON.</p> <p>Is the check washer fluid message displayed on the DIC?</p>	Go to Step 6	Go to Step 8
6	<p>1. Turn the ignition OFF.</p> <p>2. Connect the 3-amp fused jumper wire across the washer fluid level switch harness connector terminals.</p> <p>3. Turn the ignition ON.</p> <p>Is the check washer fluid message displayed on the DIC?</p>	Go to Step 9	Go to Step 11
7	<p>Test the signal circuit of the windshield washer fluid level switch for a short to ground. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 14	Go to Step 10
8	<p>Test the signal circuit of the windshield washer fluid level switch for a high resistance or an open. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 14	Go to Step 10
9	<p>Inspect for poor connections at the harness connector of the windshield washer fluid level switch. Refer to <u>Testing for Intermittent Conditions</u></p>		

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	<u>and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 14	Go to Step 12
10	Inspect for poor connections at the harness connector of the instrument panel cluster (IPC). Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 14	Go to Step 13
11	Repair the high resistance or open in the ground circuit of the washer fluid level switch. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> . Is the repair complete?	Go to Step 14	-
12	Replace the windshield washer fluid level switch. Refer to <u>Washer Solvent Container Level Sensor Replacement</u> . Is the repair complete?	Go to Step 14	-
13	Replace the IPC. Refer to <u>Control Module References</u> for replacement, setup and programming. Is the repair complete?	Go to Step 14	-
14	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 2

WASHER MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information

Washer Malfunction

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

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Windshield Washer Switch Signal	2	1	3	-
Windshield Washer Pump Control	1	1	2	-
Windshield Washer Relay Control	2	1	B3873 00	-
Windshield Washer Pump Ground	-	1	-	-
Windshield Wiper Switch Ground	-	3	-	-
1. Washers Inoperative 2. Washers Always ON 3. Windshield Wiper System Malfunction				

Circuit/System Description

The windshield washer function is controlled by the body control module (BCM). When the washer switch is pressed, ground is applied through the switch contacts and the signal circuit to the BCM indicating the wash request. The BCM then applies ground through the control circuit to the coil side of the WSH Relay energizing the relay. With the relay energized, battery voltage is applied through the switch contacts of the relay, the WSW/PUMP Fuse and the control circuit to the windshield washer fluid pump.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- Scan Tool Output Controls
- Scan Tool Data List

• Scan Tool Data Definitions

Circuit/System Testing

Washers Inoperative Starting Point

Ignition ON, with a test lamp connected to ground, probe each of the test points on the WSW/PUMP Fuse while activating the washer switch. The test lamp should illuminate at one or both of the fuse test points.

- If the test lamp does not illuminate at either test point, refer to Washer Switch Test.
- If the test lamp illuminates, refer to the Washer Fluid Pump Test.

Washer Switch Test

1. Ignition ON, verify that the scan tool Windshield Washer Switch parameter is Active while pressing the washer switch.
 - If not Active, test the following:
 - Perform the multifunction switch component test.
 - Test the windshield washer switch signal circuit for an open/high resistance. If the washer switch and circuit test normal, test or replace the BCM.
2. Ignition OFF, disconnect the C2 harness connector at the underhood fuse block.
3. Ignition ON, verify that a test lamp illuminates between the windshield washer pump relay control circuit terminal 13 and battery voltage while pressing the washer switch.
 - If the test lamp does not illuminate, test the washer relay control circuit terminal 13 for a short to voltage or an open/high resistance. If the circuit tests normal, test or replace the BCM.
4. If all circuits test normal, test or replace the underhood fuse block.

Washer Fluid Pump Test

1. Ignition OFF, disconnect the harness connector at the windshield washer fluid pump.
2. Test for less than 1 ohm of resistance between the ground circuit terminal B and ground.
 - If greater than 1 ohm, repair the ground circuit for an open/high resistance.
3. Ignition ON, verify that a test lamp illuminates between the washer pump control circuit terminal A and ground while pressing the washer switch.
 - If the test lamp does not illuminate, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, test or replace the underhood fuse block.
4. If all the circuits test normal, test or replace the windshield washer fluid pump.

Washers Always On

1. Remove the WSW fuse from the underhood fuse block. The washer pump should turn OFF.
 - If the washer pump does not turn OFF, test the washer pump control circuit for a short to voltage.
2. Ignition ON, verify the scan tool Windshield Washer Switch parameter is Inactive.
 - If not Inactive, test the following:
 - Perform the multifunction switch component test.
 - Test the windshield washer switch signal circuit for a short to ground. If the washer switch and circuit test normal, test or replace the BCM.
3. Ignition OFF, disconnect the C2 harness connector at the underhood fuse block.
4. Ignition ON, verify that a test lamp does not illuminate between the windshield washer relay control circuit terminal 13 and battery voltage.
 - If the test lamp illuminates, test the control circuit for a short to ground. If the circuit tests normal, test or replace the BCM.
5. If all circuits test normal, test or replace the underhood fuse block.

Component Testing**Multifunction Switch**

1. With the ignition OFF, disconnect the C1 harness connector at the turn signal/multifunction switch.
2. Test the resistance between terminals H and L. Rotate the wiper switch and compare the resistance readings to the values in the Windshield Wiper Switch Values table below for MIST, each DELAY and LOW speed.
 - If the resistance is not within the specified range, replace the turn signal/multifunction switch.
3. Test for infinite resistance between terminals H and K while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If the less than infinite, replace the turn signal/multifunction switch.
4. Test for less than 5 ohms of resistance with the wiper switch in the High speed position.
 - If greater than 5 ohms, replace the turn signal/multifunction switch.
5. Test for infinite resistance between terminals H and J while rotating the wiper switch to MIST, each DELAY and LOW speed positions.
 - If less than infinite, replace the turn signal/multifunction switch.
6. Test for less than 5 ohms of resistance while pressing the WASHER switch.
 - If greater than 5 ohms, replace the turn signal/multifunction switch.

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IMPORTANT: If the switch tests open in any switch position other than Off, test the wiper/washer switch signal circuits for a short to voltage before replacing the switch.

Wiper Switch Values

Switch Position	Resistance
Off	Infinite
Mist	300-364 ohms
Delay 1	3.48K-4.25K ohms
Delay 2	2.52K-3.08K ohms
Delay 3	1.78K-2.18K ohms
Delay 4	1.17K-1.44K ohms
Delay 5	697-851 ohms
Low	2.52K-3.08K ohms

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Turn Signal Multifunction Switch Replacement**
- **Washer Pump Replacement**
- **Underhood Electrical Center or Junction Block Replacement**
- **Control Module References** for BCM replacement, programming and setup

WINDSHIELD WASHER SOLVENT HEATER MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information

Windshield Washer Solvent Heater Malfunction

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery Positive Voltage	1	1	-	-
Ignition 3 Voltage	1	1	-	-
Washer Fluid Heated Control	3	1	1	-

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Switch Signal				
Windshield Washer Switch Signal	4	1	4	-
Washer Fluid Heated Control Switch LED Supply Voltage	2	2	1	-
Washer Solvent Heater Assembly Ground	-	1	-	-
Washer Solvent Heater Assembly Logic Ground	-	1	-	-
1. Windshield Washer Solvent Heater Malfunction 2. Windshield Washer Solvent Heater Indicator Inoperative 3. Windshield Washer Solvent Heater Indicator Always ON 4. Windshield Wiper System Malfunction				

Circuit/System Description

The heated windshield washer fluid operation is controlled by a separate switch located on the turn signal/multifunction switch. When the heated washer fluid switch is pressed, ground is momentarily applied through the switch contacts and the heated washer fluid switch signal circuit to the windshield washer solvent heater assembly. In response to this signal, the washer solvent heater assembly then applies battery voltage to its internal washer fluid heating elements and pulls the heated washer fluid indicator control circuit low commanding the DIC to display the HEATING WASH FLUID WASH WIPES PENDING message. The washer fluid is then heated as it passes through the heater assembly to the windshield.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

Wiper/Washer Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Testing**Windshield Washer Solvent Heater Malfunction**

1. Ignition OFF, disconnect the C1 harness connector at the windshield washer solvent heater assembly.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 2 and ground.
 - If greater than 5 ohms, test the ground circuit for an open/high resistance.
3. Ignition ON, verify that a test lamp illuminates between the battery positive voltage circuit terminal 1 and ground.
 - If the test lamp does not illuminate, test the battery positive voltage circuit for a short to ground or an open/high resistance.
4. Ignition OFF, disconnect the C2 harness connector at the windshield washer solvent heater assembly.
5. Test for less than 5 ohms of resistance between the ground circuit terminal 4 and ground.
 - If greater than 5 ohms, test the ground circuit for an open/high resistance.
6. Ignition ON, verify that a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance.
7. Connect a test lamp between the heated washer fluid switch signal circuit terminal 1 and battery voltage.
8. The test lamp should turn ON and OFF while pressing and releasing the heated washer fluid switch.
 - If the test lamp is always ON, test the control circuit for a short to ground. If the circuit tests normal, replace the turn signal/multifunction switch.
 - If the test lamp is always OFF, test the control circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the turn signal/multifunction switch.
9. Ignition ON, verify that a test lamp does not illuminate between the heated washer fluid indicator control circuit terminal 2 and ground.
 - If the test lamp illuminates, test the control circuit for a short to voltage. If the circuit tests normal, replace the instrument panel cluster (IPM).
10. If all circuits test normal, test or replace the windshield washer solvent heater assembly.

Windshield Heated Washer Fluid Indicator Inoperative

1. Ignition OFF, disconnect the C2 harness connector at the windshield washer solvent heater assembly.
2. Ignition ON, install a 3A fused jumper wire between the heated washer fluid indicator control circuit terminal 2 and ground. Verify the DIC displays the HEATING WASH FLUID WASH WIPES PENDING message.
 - If the message is not displayed, test the control circuit for a short to voltage or open/high resistance. If the circuit tests normal, replace the instrument panel cluster (IPM).
3. If all circuits test normal, replace the windshield washer solvent heater assembly.

Windshield Heated Washer Fluid Indicator Always On

1. Ignition OFF, disconnect the C2 harness connector at the windshield washer solvent heater assembly.
2. Ignition ON, the DIC should not display the HEATED WASHER FLUID WASHER SYSTEM OFF message.
 - If displayed, test the heated washer fluid indicator control circuit for a short to ground. If the circuit tests normal, replace the instrument panel cluster.
3. If all circuits test normal, replace the windshield washer solvent heater assembly.

Component Testing**Heated Washer Fluid Switch**

1. Ignition OFF, disconnect the C4 harness connector at the turn signal/multifunction switch.
2. Test for infinite resistance between the signal terminal 1 and the ground terminal 2 with the switch in the open position.
 - If less than infinite, replace the turn signal/multifunction switch.
3. Test for less than 3 ohms between the signal terminal 1 and the ground terminal 2 with the switch in the closed position.
 - If greater than 3 ohms, replace the turn signal/multifunction switch.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Turn Signal Multifunction Switch Replacement**
- **Windshield Washer Solvent Heater Replacement**
- **Control Module References** for IPC replacement, programming and setup

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Moisture Sensing Feature Inoperative

Step	Action	Yes	No
Schematic Reference: <u>Wiper/Washer Schematics</u> Connector End View Reference: <u>Wiper/Washer Connector End Views</u>			
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	Go to <u>Diagnostic System Check - Vehicle</u>
2	Verify that the moisture sensing inoperative fault is present. Does the system operate normally?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u>	Go to Step 3
3	While the windshield wiper/washer system is in the automatic mode does the wiper motor operate at normal delay intervals?	Go to Step 5	Go to Step 4
4	1. Turn the ignition ON. 2. Operate the windshield wiper/washer switch from the OFF position through all of the delay positions. Does the wiper motor cycle once and stop every time the switch is advanced to the next delay position?	Go to Step 5	Go to <u>Windshield Wiper System Malfunction</u>
5	1. Disconnect the outside moisture sensor connector. 2. Connect a test lamp from the accessory voltage circuit of the moisture sensor connector to a good ground. Does the test lamp illuminate?	Go to Step 6	Go to Step 10
6	Connect a test lamp between the accessory voltage circuit of the moisture sensor connector and the ground circuit of the moisture sensor connector. Does the test lamp illuminate?	Go to Step 7	Go to Step 11
	Test the outside moisture sensor signal 1		

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7	<p>circuit for the following conditions:</p> <ul style="list-style-type: none"> • An open • A short to ground • A short to voltage <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 8
8	<p>Test the outside moisture sensor signal 2 circuit for the following conditions:</p> <ul style="list-style-type: none"> • An open • A short to ground • A short to voltage <p>Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 9
9	<p>Inspect for poor connections at the harness connector of the outside moisture sensor. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> .</p> <p>Did you find and correct the condition?</p>	Go to Step 13	Go to Step 12
10	<p>Repair the short to ground or open in the accessory voltage circuit of the outside moisture sensor. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Is the repair complete?</p>	Go to Step 13	-
11	<p>Repair the high resistance or open in the ground circuit of the outside moisture sensor. Refer to <u>Circuit Testing</u> and <u>Wiring Repairs</u> .</p> <p>Is the repair complete?</p>	Go to Step 13	-
12	<p>Replace the outside moisture sensor</p> <p>Refer to <u>Windshield Outside Moisture Sensor Replacement</u>.</p> <p>Did you complete the replacement?</p>	Go to Step 13	-

13

Operate the system in order to verify the repair.

Did you correct the condition?

System OK

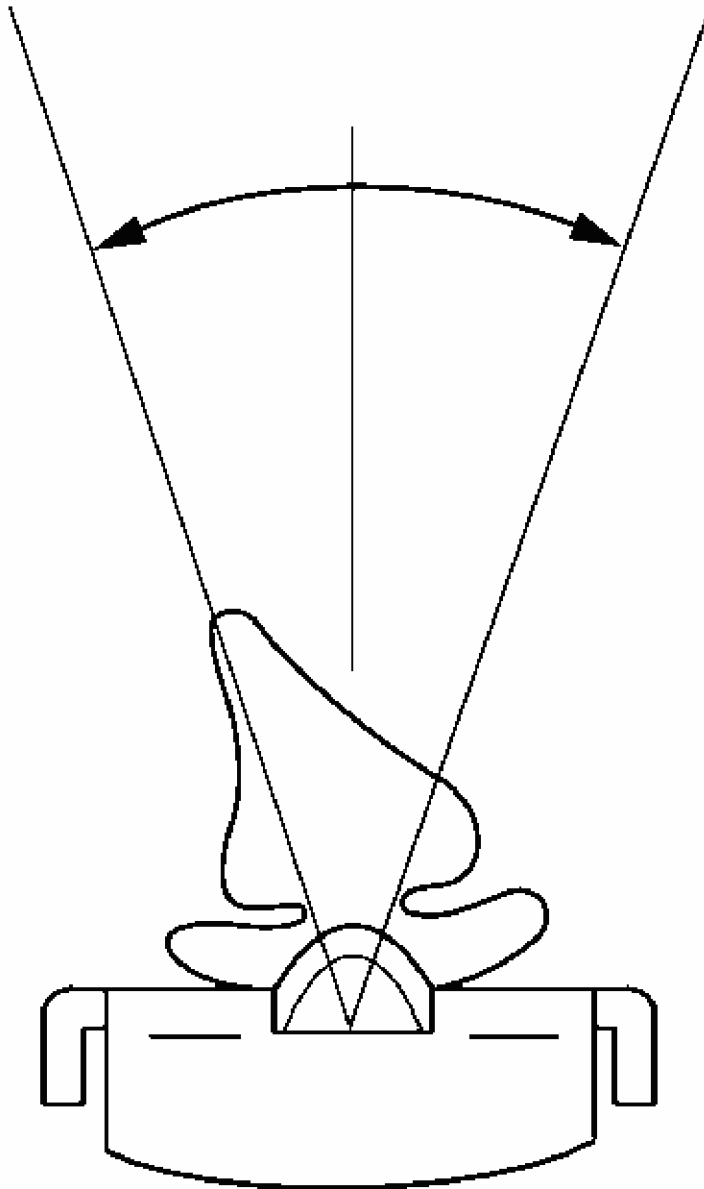
Go to **Step 2****WIPER BLADE ELEMENT CHECK**

Fig. 12: Measuring Wiper Blade Element Centerline Contact
Courtesy of GENERAL MOTORS CORP.

1. Remove the wiper blades from the wiper arms. Refer to **Windshield Wiper Blade Replacement**.
2. Look down the length of the blade element.
3. Replace the wiper blade element if the rubber element which contacts the glass is deflected more than 15 degrees from the centerline of the blade.
4. Install the wiper blades on the wiper arms. Refer to **Windshield Wiper Blade Replacement**.

REPAIR INSTRUCTIONS

WINDSHIELD WASHER SOLVENT HEATER REPLACEMENT

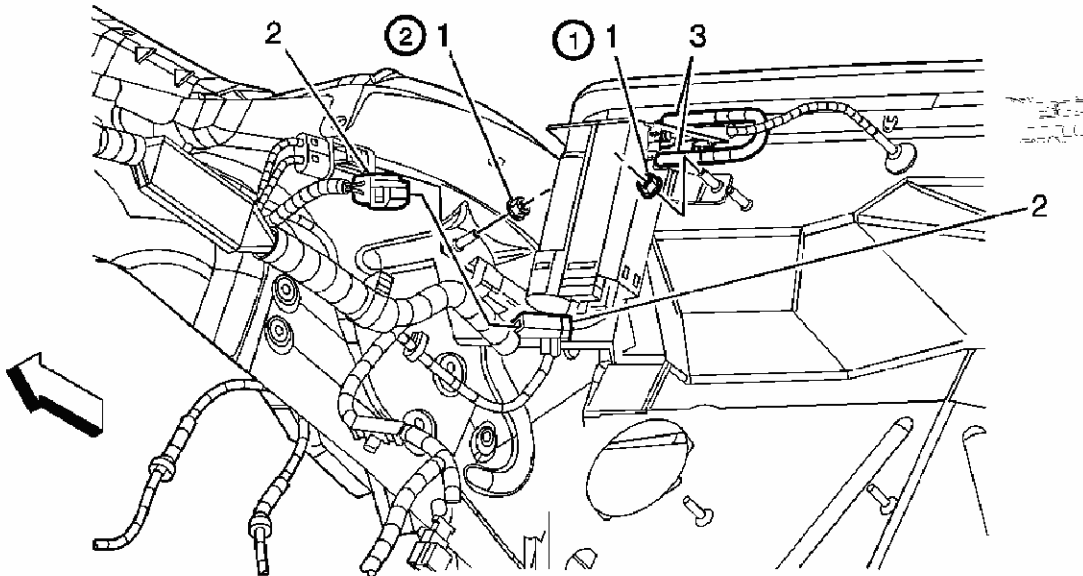


Fig. 13: Identifying Windshield Washer Solvent Heater
 Courtesy of GENERAL MOTORS CORP.

Windshield Washer Solvent Heater Replacement

Callout	Component Name
Preliminary Procedures <ol style="list-style-type: none"> 1. Open the hood. 2. Disconnect the washer hose from the heater and drain the washer solvent into a suitable container. 	
	Windshield Washer Solvent Heater Nut (Qty: 2) NOTE: Refer to <u>Fastener Notice</u> .

1	<p>Tip: Tighten the nuts in sequence as shown.</p> <p>Tighten: 10 N.m (89 lb in)</p>
2	<p>Engine Harness Electrical Connector (Qty: 2)</p> <p>Tip: Disconnect the electrical connectors 2-way and 6-way at the base of the washer solvent heater.</p>
3	<p>Windshield Washer Hose Connection</p> <p>Tip: Disconnect the windshield washer hose from the top side of the washer solvent heater.</p>

WASHER SOLVENT CONTAINER REPLACEMENT

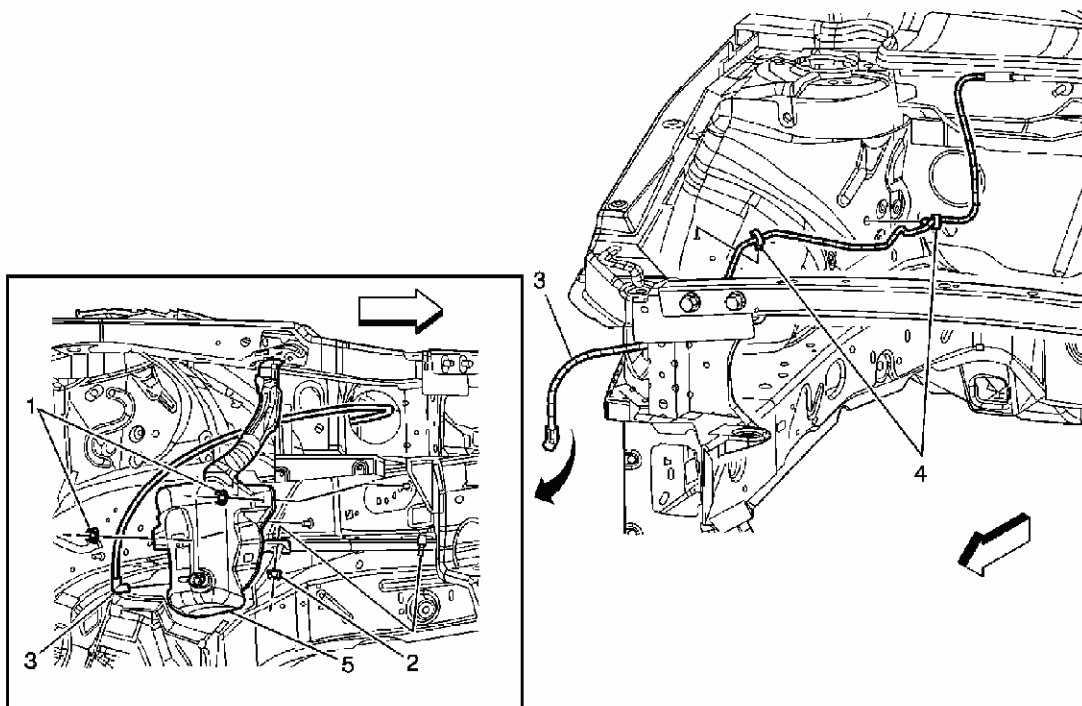


Fig. 14: Identifying Washer Solvent Container
Courtesy of GENERAL MOTORS CORP.

Washer Solvent Container Replacement

Callout	Component Name
Preliminary Procedures	
1.	Remove the right front wheelhouse panel liner. Refer to Front Wheelhouse Liner Replacement .
2.	Remove the washer pump hose from the pump and drain the washer solvent into a suitable clean container.

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3. Disconnect the electrical connector from the windshield washer solvent level sensor switch and washer pump.

1	Windshield Washer Container Assembly Nuts (Qty: 2) NOTE: Refer to <u>Fastener Notice</u> . Tip: Tighten the nuts in sequence as shown. Tighten: 6 N.m (53 lb in)
2	Windshield Washer Container Assembly Nut Tip: Tighten the nut in sequence as shown. Tighten: 6 N.m (53 lb in)
3	Windshield Washer Solvent Container Hose Assembly
4	Washer Hose Retainers (Qty: 2)
5	Windshield Washer Solvent Container Tip: Ensure the mounting tabs are flush to the rail by holding the container firmly against the rail and finger tighten the nuts upon assembly.

WASHER SOLVENT CONTAINER LEVEL SENSOR REPLACEMENT

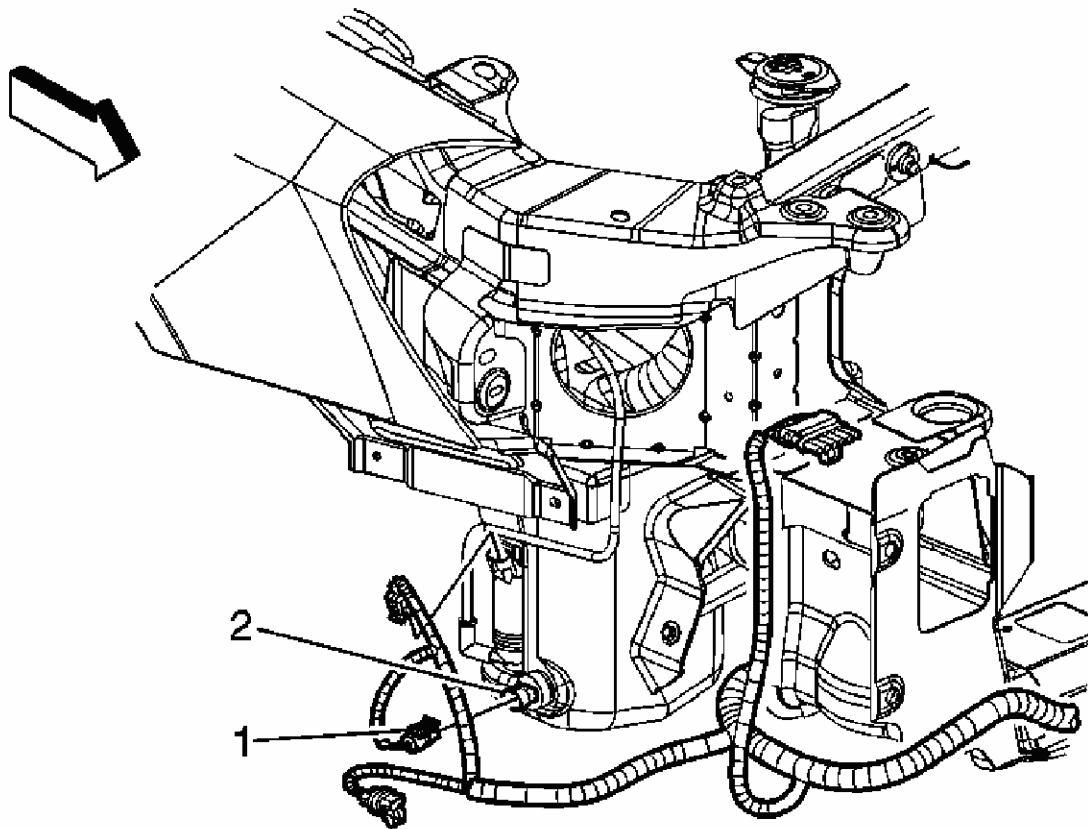


Fig. 15: Identifying Washer Solvent Container Level Sensor
 Courtesy of GENERAL MOTORS CORP.

Washer Solvent Container Level Sensor Replacement

Callout	Component Name
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedures	
1. Remove the right front wheelhouse panel liner. Refer to <u>Front Wheelhouse Liner Replacement</u> . 2. Drain the washer solvent into a suitable clean container. 3. Disconnect the electrical connector at the windshield washer level sensor switch.	
1	Level Sensor Switch Electrical Connector
2	Windshield Washer Level Sensor Switch Tip: <ol style="list-style-type: none"> 1. Use two flat-bladed tools and pry outward in order to release the level sensor from the washer solvent container grommet. 2. Discard the old level sensor switch grommet.

3. Install a new grommet into the washer solvent container prior to installing the new level sensor switch.
4. Lubricate the new grommet with straight concentrate washer fluid.

WASHER PUMP REPLACEMENT

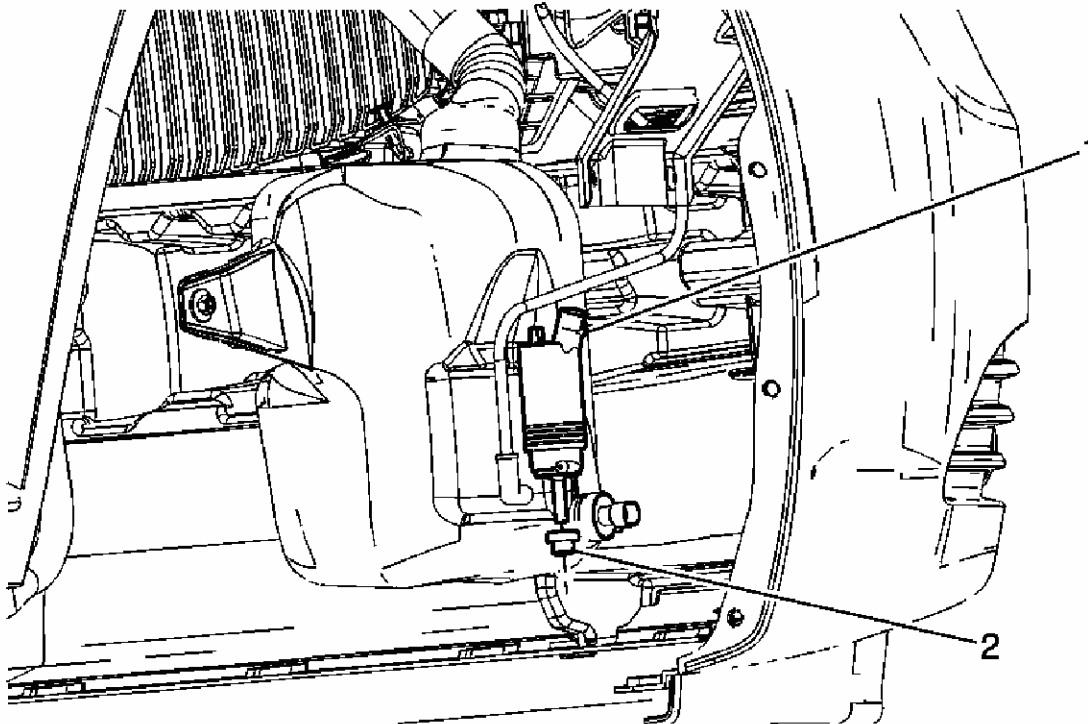


Fig. 16: Locating Washer Pump
Courtesy of GENERAL MOTORS CORP.

Washer Pump Replacement

Callout	Component Name
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedures	
<ol style="list-style-type: none"> 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u>. 2. Remove the RF tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u>. 3. Remove the forward portion of the RF wheelhouse liner. Refer to <u>Front Wheelhouse Liner Replacement</u>. 4. Disconnect the windshield washer pump hose from the pump and drain the washer solvent into a suitable clean container. 	

1	<p>Windshield Washer Pump</p> <p>Tip:</p> <ol style="list-style-type: none"> 1. Release the top of the washer pump from the windshield washer container. 2. Using two flat-bladed tools under the pump, pry upwards under the pump to release the pump from the washer container.
2	<p>Windshield Washer Pump Grommet</p> <p>Tip: Discard the grommet and replace with a new grommet. Use straight washer fluid to lubricate the new grommet for installation into the washer container.</p>

WINDSHIELD WIPER ARM REPLACEMENT

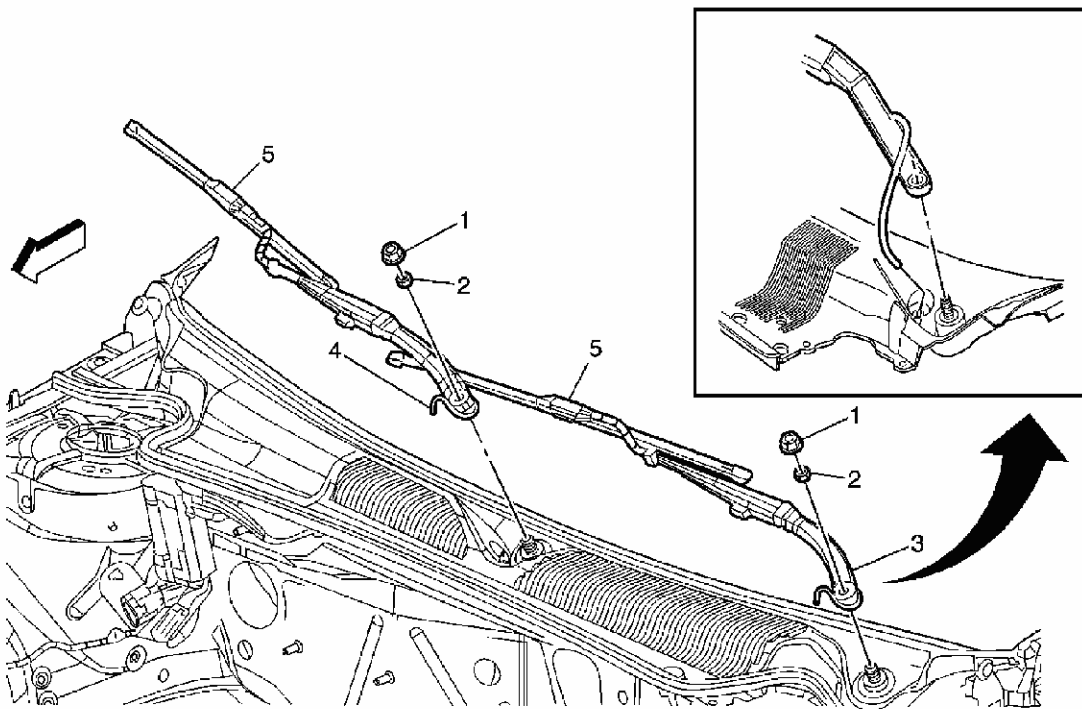


Fig. 17: View Of Windshield Wiper Arms
Courtesy of GENERAL MOTORS CORP.

Windshield Wiper Arm Replacement

Callout	Component Name
<p>Preliminary Procedure:</p> <p>Remove the wiper arm blades. Refer to Windshield Wiper Blade Replacement.</p>	
1	<p>Windshield Washer Arm Finish Cap</p> <p>Tip: Use a small flat-bladed tool to remove the finish cap.</p>

2	<p>Windshield Washer Arm Nut</p> <p>NOTE: Refer to <u>Fastener Notice</u> .</p> <p>Tip: Hold the wiper arm blade tip to the target points in the lower blackout area of the windshield while tightening the nut.</p> <p>Tighten: 32 N.m (24 lb ft).</p>
3	<p>Windshield Washer Arm Assembly</p> <p>Tip: Use a J 39637 or slightly rock the arm on the wiper pivot shaft to remove. See <u>Special Tools</u>.</p>
4	<p>Windshield Wiper Arm Hose</p> <p>Tip: Note the correct hose routing around the wiper arm, see insert.</p>
5	<p>Wiper Arm</p>

WINDSHIELD WIPER BLADE REPLACEMENT

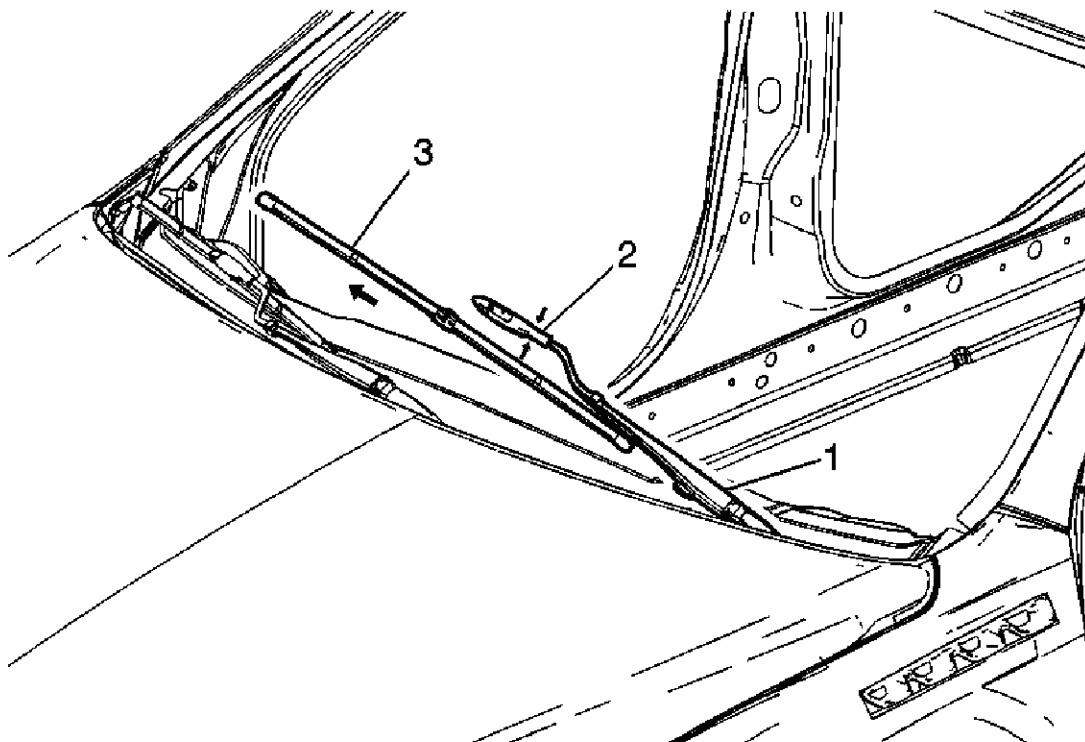


Fig. 18: View Of Windshield Wiper Blades
Courtesy of GENERAL MOTORS CORP.

Windshield Wiper Blade Replacement

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Callout	Component Name
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedure: Raise the wiper arm to the full up position, (service up).	
1	Windshield Wiper Arm Assembly
2	Windshield Wiper Arm Blade Tabs Tip: Squeeze both tabs and rotate the blade forward, away from the arm to remove.
3	Windshield Washer Blade Assembly Tip: Discard the blade if the rubber element appears worn or does not wipe the windshield clean.

WINDSHIELD WIPER MOTOR REPLACEMENT

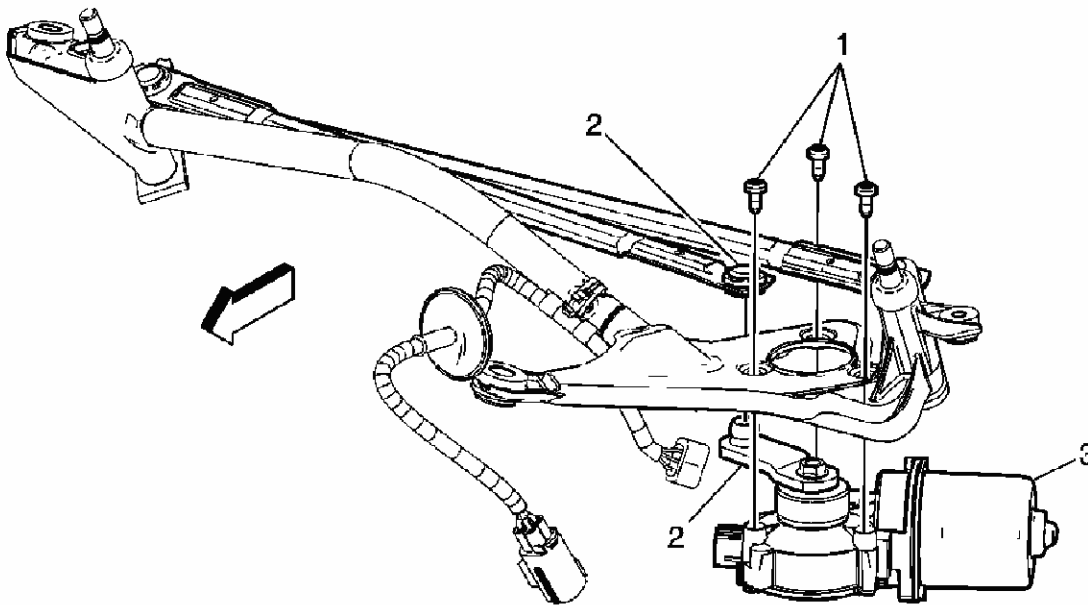


Fig. 19: Removing/Installing Windshield Wiper Motor
Courtesy of GENERAL MOTORS CORP.

Windshield Wiper Motor Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> .	
Preliminary Procedure	

1. Remove the windshield wiper transmission. Refer to **Windshield Wiper Transmission Replacement**
2. Disconnect the electrical connector at the wiper motor.

1	Wiper Motor Screws (Qty: 3) Tighten: 10 N.m (89 lb in)
2	Wiper Motor Crank Arm Ball Socket Tip: Using the J 39232 separate the crank arm from the wiper transmission arm. See Special Tools . Use the to J 39529 secure the crank arm to the transmission link. See Special Tools .
3	Windshield Wiper Motor Tip: The wiper motor is set at the park position from the factory.

WINDSHIELD WIPER TRANSMISSION REPLACEMENT

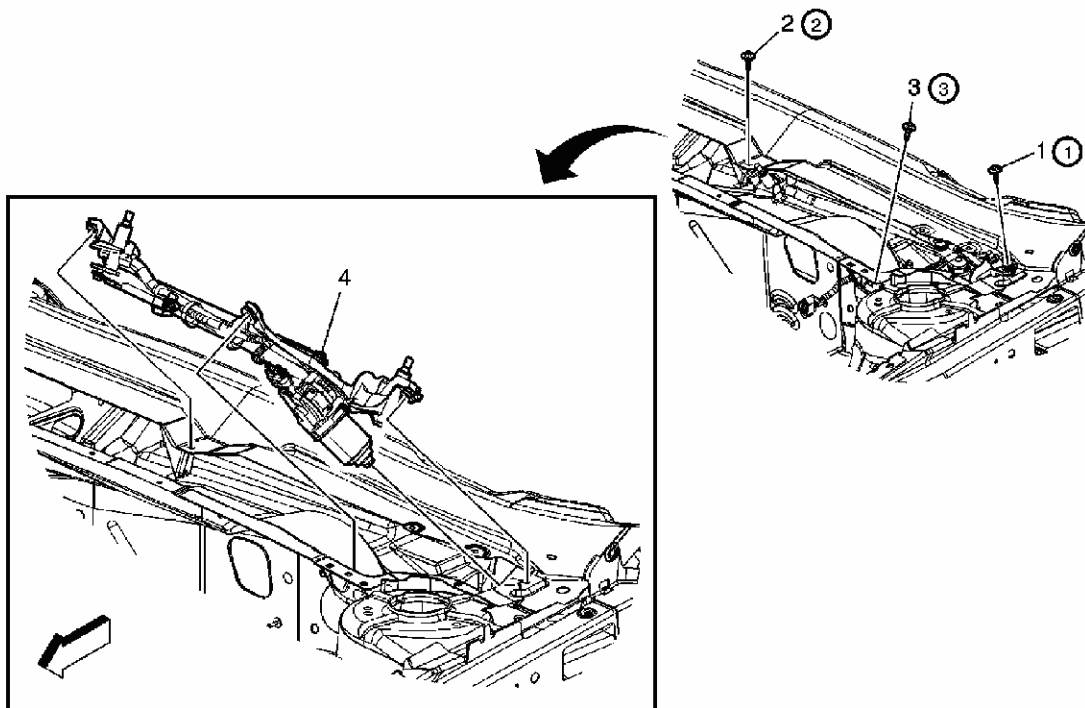


Fig. 20: Removing/Installing Wiper Transmission
Courtesy of GENERAL MOTORS CORP.

Windshield Wiper Transmission Replacement

Callout	Component Name
Preliminary Procedures	
1.	Remove the wiper arms. Refer to Windshield Wiper Arm Replacement .

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2. Remove the air inlet grille panel. Refer to **Air Inlet Grille Panel Replacement** .
3. Remove the windshield frame reinforcement.
4. Disconnect the wiper transmission electrical connector from the main engine harness.

1	<p>Windshield Washer System Module Bolt</p> <p>NOTE: Refer to <u>Fastener Notice</u> .</p> <p>Tighten: 9 N.m (80 lb in)</p> <p>Tip:</p> <ol style="list-style-type: none">1. Raise the rearward edge of the module assembly out of the plenum panel first followed by wiper motor.2. Tighten bolts in sequence as shown upon installation.
2	<p>Windshield Washer System Module Bolt</p> <p>Tighten: 9 N.m (80 lb in)</p>
3	<p>Windshield Washer System Module Bolt</p> <p>Tighten: 9 N.m (80 lb in)</p>
4	<p>Windshield Washer System Module</p>

WINDSHIELD OUTSIDE MOISTURE SENSOR REPLACEMENT

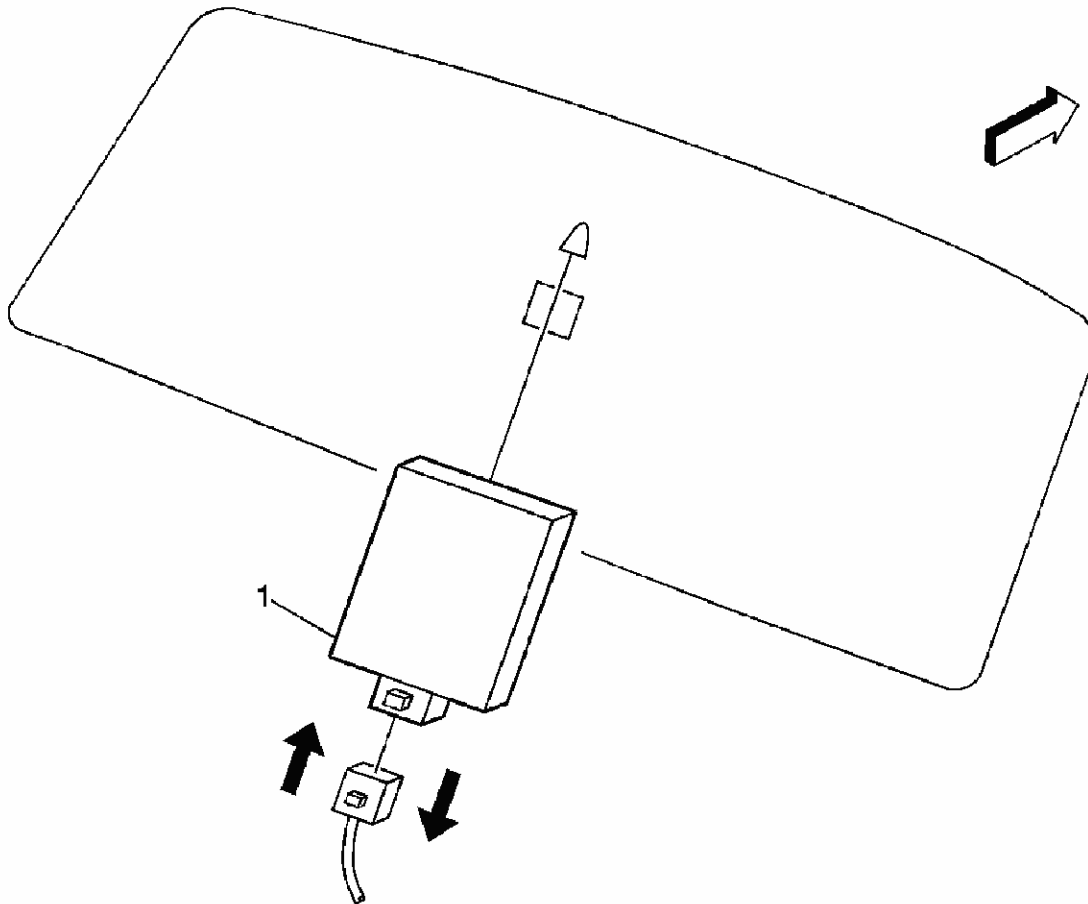


Fig. 21: Removing/Installing Windshield Outside Moisture Sensor
 Courtesy of GENERAL MOTORS CORP.

Windshield Outside Moisture Sensor Replacement

Callout	Component Name
Fastener Tightener Specifications: Refer to <u>Fastener Tightening Specifications</u>.	
1	Windshield Outside Moisture Sensor Tip: <ol style="list-style-type: none"> 1. Disconnect the electrical connector. 2. Unclip the sensor from the windshield.

WIPER CHATTER REPAIR

Some vehicles may exhibit a condition where the windshield wipers chatter and/or wipe unevenly. Several items may contribute to this condition. To completely repair this condition, ALL of the items listed should be tested and repaired as necessary.

- Clean the windshield glass. Refer to **Windshield Glass Cleaning**.

- Clean the wiper blade elements. Refer to **Blade Element Cleaning**.
- Inspect the wiper blade element set. Refer to **Wiper Blade Element Check**.

WINDSHIELD GLASS CLEANING

Clean the windshield with windshield cleaner, GM P/N 1050011 (Canadian P/N 992727) or equivalent. The cleaner should not harm the paint finish or scratch the glass. The glass is clean when the water no longer beads, but sheets across the entire glass surface.

BLADE ELEMENT CLEANING

Lift each blade assembly off of the windshield and clean the element with a cloth saturated with full strength washer solvent. Then rinse the blade assemblies with clear water.

DESCRIPTION AND OPERATION

WIPER/WASHER SYSTEM DESCRIPTION AND OPERATION (WIPERS AND WASHERS)

Wiper/Washer System Components

The Wiper/Washer System consists of the following components:

- Windshield wiper/washer switch
- Body control module (BCM)
- WPR Relay
- WPR HI Relay
- Windshield wiper motor
- Windshield washer fluid pump
- Windshield washer fluid level switch
- Rain sensor module
- Instrument panel cluster (IPC)
- WPR Fuse 25 A
- WSW/PUMP Fuse 10 A
- RAP Fuse 10 A

Refer to **Wiper/Washer Component Views**.

Power and Grounds

With the ignition in the ON position, accessory voltage is supplied through the 25A WPR fuse to the WIPER relay, the WIPER HI relay and the WSH relay that are all located in the underhood fuse block. Refer to **Wiper/Washer Schematics**.

G101 provides ground for the windshield wiper motor. G104 provides ground for the WPR relay, the WPR HI relay, the windshield washer fluid pump and the windshield washer fluid level switch.

Modes of Operation

The normal wiper system function positions are as follows:

- MIST
- DELAY
- MANUAL LOW
- MANUAL HIGH
- WASH

Automatic Modes of Operation

- AUTOMATIC DELAY
- AUTOMATIC LOW
- AUTOMATIC HIGH

Automatic low speed and automatic high speed wiper modes are continuous wiper operations that are controlled by the outside moisture sensor. Automatic low and high speed operation is utilized when the amount of precipitation on the windshield exceeds the automatic delay or low threshold.

Moisture Sensitive Wipers

The outside moisture sensor monitors moisture accumulation on the windshield and uses a windshield wiper/washer switch status input to provide wipe commands to the body control module (BCM). The DELAY positions on the wiper/washer switch are used to activate the AUTOMATIC rain sensing operating mode. They are also used to adjust the level of sensitivity to moisture accumulation, which determines the dwell time for commanding a wiper motor wipe cycle.

Accessory voltage is supplied to the outside moisture sensor through the 10A RAP Fuse, located in the rear fuse block. The sensor is grounded through the ground circuit and G402. Whenever the ignition is in the run or accessory positions, the BCM sends the wiper/washer switch status using a pulse width modulation (PWM) signal through the outside moisture sensor signal 1 circuit to the outside moisture sensor. When a wipe cycle is needed, the moisture sensor sends a PWM voltage signal through the moisture sensor signal 2 circuit back to the BCM requesting the wiper operation.

The outside moisture sensor uses the moisture sensor signal 2 circuit to command wiper motor wipe cycles and to confirm the moisture sensor signal 1 is being received. If at anytime

communication between the outside moisture sensor and BCM is lost, the BCM will use the inputs from the windshield wiper/washer switch in the delay positions to operate the wiper motor at continuous variable delay intervals.

Low Speed Operation

When the wiper switch is in the low speed position, ground is applied through a resistor internal to the switch and the wiper switch low signal circuit to the body control module (BCM). In response to this signal, the BCM energizes the WPR relay by applying battery voltage through the wiper relay control circuit to the coil side of the relay. This allows battery positive voltage from the WPR fuse to flow through the switch input side of the WPR relay and out to the switch input side of the WPR HI relay. Since the wiper high relay is de-energized and its switch contacts are normally closed to the low speed control circuit of the windshield wiper motor, the motor will operate at low speed.

Wiper motor low speed operation and the WPR relay can also be commanded ON/OFF by using a scan tool. Refer to **Scan Tool Output Controls**.

Mist Operation

Windshield wiper/washer system MIST operation is identical to wiper Low operation, except that the mist switch is a press and release type switch. When the wiper switch is moved to the mist position and released, low speed wiper motor operation is started and will continue until 1 wipe cycle is complete. If the wiper switch is moved to the mist position and held, the wiper motor will operate in the low mode until the switch is released.

Delay Operation

Windshield wiper delay operation is a low speed wiper motor function with a variable delay interval between the wiper motor cycles. The delay interval is determined by a series of 6 resistors within the wiper/washer switch. The body control module (BCM) monitors the wiper switch low signal circuit to determine the delay interval between the low speed wiper motor wipe cycles.

High Speed Operation

When the wiper switch is in the high speed position, ground is applied through the windshield wiper switch high signal circuit to the body control module (BCM) indicating the wiper high speed request. In response to this signal, the BCM then energizes the WPR relay, as stated above and the WPR HI relay by applying ground through the control circuit to the coil side of the relay. With the wiper high relay energized and its switch contacts closed to the high speed control circuit of the wiper motor, the motor will operate at high speed.

The wiper high speed relay can also be commanded ON/OFF by using a scan tool. However, before commanding the wiper motor high speed mode ON/OFF using a scan tool, the WPR

relay must be energized by placing the wiper switch in the low speed position. Refer to **Scan Tool Output Controls**.

Wash Operation

When the windshield Wash switch is pressed, ground is applied through the switch contacts and the windshield washer switch signal circuit to the body control module (BCM) indicating the windshield wash request. The BCM then energizes the WPR relay, as stated above and the WSH relay by applying ground through the control circuit to the coil side of the relay. With the wash relay energized, battery voltage from the WPR fuse is applied through the switch side of the relay and out to the control circuit of the windshield washer fluid pump. The wiper motor will operate for 2 wipe cycles after the wash switch is released.

The WSH relay can also be commanded ON/OFF by using a scan tool. Refer to **Scan Tool Output Controls**.

Park Position Operation

Windshield wiper motor park operation is controlled by the body control module (BCM) using an input from the park switch that is located within the wiper motor assembly. The BCM monitors the windshield wiper motor park switch signal circuit, to determine if the windshield wiper blades are at the bottom of the glass. During wiper operation, each time the wiper blades are at the bottom of the glass, the park switch is momentarily closed to ground signaling the BCM the wiper position. When the wiper switch is turned to the OFF position while the wiper motor is somewhere in mid-cycle, the BCM will continue to operate the motor until the wipers reach the park position. If the ignition is turned OFF while the wipers are in mid-cycle, the wipers will stop immediately where they are. The BCM will park the wipers the next time the ignition is turned ON.

Washer Fluid LOW ADD FLUID Message

The WASHER FLUID LOW ADD FLUID message is controlled by the instrument panel cluster (IPC) using an input from the washer fluid level switch. With the ignition in the ON position, the IPC applies ignition voltage through an internal resistor and the windshield washer fluid level signal circuit to the windshield washer fluid level switch. The IPC then monitors this voltage to determine the washer fluid level. With the washer fluid above a determined level, the washer fluid level switch is open and the IPC detects voltage on the signal circuit. When the washer fluid reaches the point where the driver should be informed that the washer fluid is low, the washer fluid level switch closes. When the washer fluid level switch is closed, the washer fluid level signal circuit is pulled low and the IPC displays the WASHER FLUID LOW ADD FLUID message on the driver information center (DIC). In order to prevent the WASHER FLUID LOW ADD FLUID message from being displayed while sloshing is occurring in the washer fluid container, the IPC is programmed with a 1 minute delay before changing states of the WASHER FLUID LOW ADD FLUID message during an ignition cycle.

WIPER/WASHER SYSTEM DESCRIPTION AND OPERATION (HEATED WASHER SYSTEM)

The heated windshield washer system consists of the following components:

- Windshield washer solvent heater assembly
- Heated washer fluid switch
- WSW HTD Fuse 60 A
- HTD/COOL/IGN3 Fuse 10 A
- Ground G304
- Ground G300

The body control module (BCM) is also involved in the operation of the heated windshield washer system.

Refer to **Wiper/Washer Component Views**.

Heated Washer System Operation

The intent of the Heated Washer Fluid Feature is to automatically clear the windshield of snow or ice upon activation. The system may also be used to improve the bug clearing performance of the wash feature under summer driving conditions. Approximately 5 seconds after the ignition is turned on the washer solvent heater assembly will enter standby mode. During standby mode the heater assembly turns on 1 of the 3 heater elements to maintain a solvent temperature of 56°C (132°F). When the heated wash switch is pressed, the driver information center (DIC) will display the HEATING WASH FLUID WASH WIPES PENDING message for 2 seconds and the heater assembly heats the wash fluid to approximately 70°C (160°F). The total duration of the initial heat up cycle may take up to 45 seconds. Once the proper temperature is reached, the heater assembly will request the body control module (BCM) to activate the windshield wash cycle. The heater assembly will maintain an active wash request until the wash fluid temperature drops to 40° C when the wash cycle request will be de-activated allowing the wash fluid to heat up again. The fluid heating and wash application will automatically be repeated 3 more times. Upon completion of the 4 wash cycles, the system will transition to off. The automatic heated wash mode may be terminated at any time by pressing the heated washer fluid switch. The DIC will then display the HEATED WASHER FLUID WASH SYSTEM OFF message.

Heated Washer System Power and Grounds

High current battery voltage is supplied to the windshield washer solvent heater assembly from the 60A WSW HTD Fuse located in the underhood fuse block. The washer solvent heater uses this voltage to power the 3 heater coils. Battery positive voltage from the 10A HTD/COOL/IGN3 Fuse located in the rear fuse block is applied to the windshield washer solvent heater assembly with the ignition in the ON position. This voltage is used to power up

the logic in the heater assembly. The washer solvent heater assembly is supplied with 2 separate ground circuits from G304. One circuit is used to supply ground to the logic side of the heater assembly and the second one is used as a ground for the 3 heater coils. Ground is supplied to the heated washer fluid switch from G300. Refer to **Wiper/Washer Schematics**.

Heated Washer System Circuit Description

The washer solvent heater assembly provides a 5 volt reference voltage through the heated washer fluid switch signal to the heated washer fluid switch located on the Turn Signal/Multifunction Switch stalk. When the heated washer fluid switch is pressed, the signal circuit is closed to ground and the 5 volt supply is dropped across the resistor indicating the heated wash cycle request. The heater assembly sends a low side drive pulse width modulation (PWM) signal through the heated washer indicator signal circuit requesting the instrument panel cluster (IPC) to display the DIC HEATING WASH FLUID WASH WIPES PENDING message. After the above mentioned washer solvent temperature is reached, the heater assembly pulls the windshield washer switch signal circuit low requesting the BCM to activate the wash cycle.

Automatic Shutdown Protection Feature

Below are automatic shutdown modes built into the heated wash system. When any of these modes are activated, the heated assembly will shut down and request the IPC to transition the DIC to display the HEATED WASHER FLUID WASHER SYSTEM OFF message.

- Under Voltage - The system will shut down if battery voltage goes under 10 volts for 5 seconds.
- Fail to Heat - The system will shut down if the fluid does not heat by 5°C (41°F) within 28 seconds.
- Fail to Cool - The system will shut down if the fluid does not cool by 2°C (36°F) 4.75 seconds.

The following shutdown modes will require an ignition cycle to resume normal operation:

- Printed Circuit Board (PCB) Temperature Over Threshold - The system will shut down if the unit PCB is greater than 125°C (257°F) for more than 2 seconds.
- Temperature Sensor Shorted High - An internal heater assembly measurement. The system will shut down if an internal short is detected.
- Automatic Over Temperature - The system will shut down if fluid temperature exceeds 85°C (185°F) for 2 seconds.
- Automatic Over Voltage - The system will shut down if battery voltage exceeds 16.4 volts for 4 seconds.

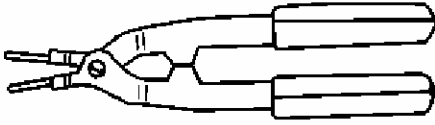

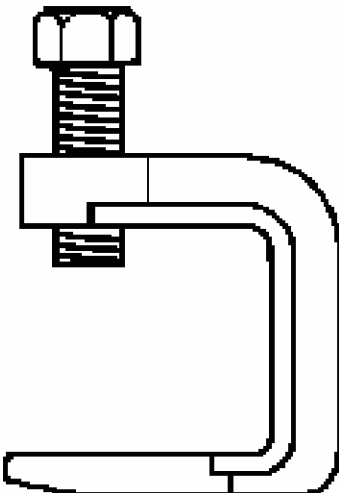
SPECIAL TOOLS AND EQUIPMENT

2006 Buick Lucerne CXS

2006 ACCESSORIES & EQUIPMENT Wipers/Washer Systems - Lucerne

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J-39232 Wiper Linkage Separator
	J-39529 Wiper Linkage Installer
	J-39637 Wiper Arm Puller

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